Information and Impatience: Evidence from Evaluations in Two Developing Countries

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Declaration

The contents of this dissertation are the result of original research, are entirely my own work and have not been submitted for a postgraduate degree at another university.

Dinuk Sanjaya Jayasuriya

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Abstract

This dissertation undertakes three evaluations estimating the impacts of micro-savings, time preferences and state-run newspaper bias on individual or household behaviour in the Solomon Islands and Sri Lanka. All three evaluations use survey level data. The first evaluation is based in the Solomon Islands and follows a quasi-experimental design where 481 people are surveyed across 19 villages. It asks the question: "Does access to formal savings facilities by rural Pacific Island villagers impact on their welfare?" Results show intervention significantly reduces the difficulty associated with paying for higher value less frequent items (i.e. 'lumpier' items). The second evaluation is also based in the Solomon Islands and follows a quasi-experimental design where 499 people are surveyed across 11 villages. It asks the question: "Do time preferences impact on an individual's decision to maintain an open savings account?" Results show that the average person who demonstrates time inconsistency is more likely to maintain an open savings account than the average person who demonstrates time consistency. The third evaluation is based in Sri Lanka and follows a randomised design where 840 people are surveyed across 56 villages. It asks the question: "Does home delivery of state-run newspapers influence the political opinions of individuals to conform to the views of the state?" Results show home delivering a state-controlled newspaper significantly influences some political opinions of individuals to conform to the views of the state.

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Chapter 1 – Introduction

There has been much debate regarding the effectiveness of development assistance. Sachs (cited in Snowdon 2005:53) illustrates the success of development assistance to Bolivia and Poland and claims to know "innumerable successful aid programmes of significant scale". Easterly (2007:329) counters that "successful cases of development happening due to a large inflow of aid and technical assistance have been hard to find". He notes that "the top quarter of aid recipients ... received 17 percent of their GDP in aid" over the past 42 years and "had near-zero per capita growth" (Easterly 2007:329).

The debate regarding the extent to which development assistance has been effective or ineffective will undoubtedly continue. Considering this uncertainty and the vast sums of money spent on development programs, the need for rigorous evaluations to determine effectiveness of program implementation is of critical importance. Indeed Sachs (cited in Snowdon 2005:54) argues that "if someone is really serious about the aid issue they should take a micro-perspective" to evaluate specific development programs as opposed to using "gross over-the-top generalisations". Given such a need, this dissertation undertakes three evaluations of increasing rigor across three topical development issues[1] that have been unexplored in sufficient detail.

The first evaluation involves estimating the impacts of a program intervention on households and occurs a year after the program has begun. In situations where evaluation does not begin until project implementation has been completed and prior survey data does not exist, a cross-sectional quasi-experimental approach where groups receiving program intervention (treatment groups) are compared with non-equivalent groups (control groups) represents one of the few viable alternatives (Bamberger, Rugh and Mabrt 2006). In quasi-experimental designs of this nature, it is difficult to ensure pre-intervention, the characteristics of the average household in treatment and comparisons groups are statistically identical. Consequently this approach invariably suffers from omitted variable problems; estimated impact of intervention at a cross-sectional level, measured after an

[1] The particular development issues investigated will be considered later in this chapter.

appropriate intervention period[2], may include both the influence of intervention *and* omitted variables. Hence, any evaluation of this nature has to take into consideration omitted variable bias in its methodological design.

In addition to evaluating impact of a program on households, donors may want to know what types of individuals actually demand programs prior to investing money in large scale program expansion. Hence the second evaluation focuses on impact of particular individual characteristics on the demand for a program and, like the first evaluation, follows a cross-sectional quasi-experimental design. Many organisations undertake basic field research including performing interviews of some key stakeholders to determine which communities demand particular programs[3]. However there are instances where organisations support a more rigorous approach. For example, Ashraf, Karlan and Yin (2006) evaluated whether there were individual characteristics of regular savers that may encourage take-up of a commitment savings product. If such individual characteristics exist and are easily identifiable, development organisations can appropriately target their products after initial evaluation. In circumstances where the evaluation cost is a small percentage of the overall program cost, such preliminary analysis may benefit organisations by saving them both time and money.

A limitation of using a cross-sectional quasi-experimental design to measure characteristics of program take-up is that it too suffers from omitted variable bias; there may be more characteristics that influence program take-up than those considered in the cross-sectional regression.

Similarly to the first evaluation, the third evaluation undertaken in this dissertation also focuses on the impact of an intervention. However, as opposed to the first two evaluations, the final evaluation follows a more rigorous experimental approach. It involves randomly

[2] Intervention period refers to the period from when an intervention began, and when the final survey for the evaluation was undertaken. These intervention periods vary and need to be sufficiently long for impact to occur. For instance intervention periods can last ten weeks (Gerber, Karlan and Bergan 2009), one year (Ashraf, Karlan and Yin 2006) or two and a half years (Ashraf, Karlan and Yin 2008).

[3] ANZ bank in the Solomon Islands, Vanwods in Vanuatu and Terre des Hommes Netherlands in Sri Lanka are just some examples.

assigning targeted individuals to treatment or control groups[4] where only the treatment groups are offered intervention. Critically, given a reasonably large sample size[5], the randomisation process assumes characteristics of average individuals in treatment and control groups are statistically similar. After an appropriate intervention period, the intervention would represent the only difference between the average individual in the two groups[6]. Thus, experimental designs are superior to quasi-experimental designs in that they do not suffer from omitted variable bias.

Despite the superiority of experimental designs over quasi-experimental designs, they are only used on a limited scale by development organisations (Donaldson, Christie and Mark 2008). This is mainly due to time and budget constraints and because in certain cases, it is unethical to randomly provide intervention to some people and not to others (Ravallion 2005). Further, in most instances, the evaluator is not hired until post program intervention, implying it is not possible to randomly select groups pre-intervention (Bamberger *et al.* 2006). Indeed, the first evaluation undertaken in this dissertation followed a quasi-experimental design as evaluation began one year after initial program implementation.

La Londe (1986) was one of the first proponents of using experimental designs over quasi-experimental designs. Bamberger *et al.* (2006) considers the use of experimental designs impractical in many real world situations. Nevertheless, in the last eight years, there has been a steady increase in experimental evaluations (see studies undertaken by researchers at the Abdul Latif Jameel Poverty Action Lab[7]). Moreover, it implies in many cases, experimental evaluations are practical and feasible if development organisations have the funding, foresight and technical assistance to design the evaluation prior to program inception.

To be clear, randomisation may not necessarily always be the preferred option. Randomised designs may lead to ethical questions such as why certain people should

[4] Experimental designs may also involve random assignment of other units such as animals or agricultural plots.
[5] Experimental designs generally involve surveying more than 800 people (see for example Ashraf *et al.* 2006).
[6] Clearly this assumes external factors, which may influence variables being investigated during the intervention period, affect the average treatment and control group member to a statistically identical extent.
[7] Refer <http://www.povertyactionlab.com/>.

receive intervention while other equally eligible people do not[8]. Further, randomised studies generally focus on the average impact of offering intervention on a group of people (intent-to-treat effect) and the average impact of intervention on people who accept treatment (treatment on the treated effect). Deaton (2009) argues that average impacts are rarely enough – policy makers also want heterogeneous analysis such as demographic characteristics of people who experience positive and negative changes. Ravallion (2009) contends the impacts of intervention may spillover to other people (not captured in the sample) and results from randomised designs may not be applicable to everybody nor may be replicable on a large scale.

This dialog suggests that randomised studies should not be considered the only available tool for development practitioners. Nevertheless, when focusing on the evaluations undertaken for the purposes of this thesis, the randomised approach provides the greatest internal validity. Moreover, issues relating to the average effect, neglecting impacts of spillover bias and the potential inapplicability of results to other groups of people exist in quasi-experimental designs as well. While the randomised approach is not perfect, it is more rigorous than the quasi-experimental designs undertaken in this thesis.

Ultimately the methodological designs used in the three studies vary in rigor depending on the level of information provided. Birchler and Facchinetti (2007:64) explain the decision to acquire information can be considered as a trade-off between quality and cost. They mathematically consider whether the additional benefit of a bank acquiring more information on the true state of the world would exceed the cost of doing so. Literature is flush with other examples such as the trade-offs between quality of information and the costs of gathering information faced by firms (James and Lawler 2008), regulators of security markets (Mulherin 2007), decision makers (Connolly and Serre 1984) and financial market investors (Beneish and Yohn 2008).

The concept of a trade-off between information quality and information cost can readily be applied to trade-offs in the three studies undertaken in this dissertation. In relation to the first and second evaluations, an experimental approach that addressed issues relating to

[8] The counter argument is that intervention should not be administered without knowing its effects and there may be inadequate funding for extensive intervention.

omitted variable bias could have been possible if the intervention had expanded into other areas. However waiting for the expansion would have been costly if the organisation providing intervention did not decide to collaborate with any future research. Conversely in relation to the third study, the information would not have been gained without planning the experiment in advance; in this instance the informational benefit gathered from the study exceeded the cost of not undertaking the experiment. Further, as the study could be designed *ex-ante*, it would be more beneficial to use a rigorous experimental approach as opposed to a quasi-experimental method.

The three evaluations in this dissertation use contrasting methodologies to illustrate some of the different approaches to evaluation in literature. As highlighted in chapter 2, each subsequent evaluation increases in methodological rigour, demonstrating the benefits of using experimental designs over quasi-experimental designs.

Using information gathered from survey data, the three main chapters of this dissertation respectively estimate the impacts of micro-savings, time preferences and state-run newspaper bias on individual or household behaviour in developing countries. All three studies have potential implications on development policy including whether to increase access to micro-savings facilities and whether programs to counter or limit bias from state-run media should be expanded.

The research question, the motivation for each research question, hypothesis and main results of the three evaluations follow.

First Evaluation

There has been an increase in organisations providing micro-savings services to the poor in Pacific Island countries (Conroy 2006; Flaming and Mathison 2007). Additionally, Australia National Bank (ANZ), Westpac Bank and the largest bilateral donor in the Pacific Island countries, the Australian Agency for International Development (AusAID), are increasing their funding of micro-savings related initiatives. But is the expense involved in supporting the expansion of access to formal savings facilities justified? Given the increased investment in micro-savings facilities, evaluating whether there is a welfare impact from expanding access to formal savings facilities takes on an added urgency.

In general, literature does not explicitly measure 'welfare impact' from access to formal savings facilities. For instance, Ashraf, Karlan and Yin (2008) undertake a natural field experiment in the Philippines to estimate impact when formal savings facilities are used as a commitment device. They note that increased access to commitment savings facilities increases savings levels. However they caution that this does not necessarily translate to increased welfare and as a consequence, additional research is required. Further, Ashraf, Karlan and Yin (2004) illustrate money from informal savings can be reallocated into formal savings facilities, where formal savings facilities can then be used as a form of deposit and withdrawal discipline. Literature also argues formal savings facilities are beneficial due to their anonymity (Vonderlack and Schreiner 2002) and when they are used as accumulation devices for large payments (Aghion and Morduch 2005). Nevertheless, none of this literature provides an actual definition of welfare. The only paper that appears to allude to a definition of welfare is Ashraf *et al.* (2008) that suggests the average woman who opens a commitment savings facility achieves a statistical improvement in her feelings of empowerment.

Presumably people would only undertake an optional activity, such as increasing their level of savings in a formal savings facility, if *they believe* it improves their welfare. Conversely, if they believe it has a negligible welfare impact, people would simply maintain the same savings habits they had prior to accessing a formal savings facility. Hence, for the purposes of this evaluation, one measure of increased welfare from using formal savings as a commitment device will be defined as increases in levels of savings. Further, increased welfare due to formal savings facilities being used as reallocation[9] tools will be defined as the increased discipline savers have over their own savings and expenditure patterns. Finally, increased welfare due to formal savings facilities being used as payment tools will be defined as decreased difficulty in paying for particular items.

The first evaluation is motivated by wanting to determine whether there is justification for increased support of micro-savings facilities in Pacific Island countries. Hence, the first evaluation which surveyed 481 people, asks the research question: "Does access to formal

[9] This refers to the reallocation of savings from informal options (such as keeping savings at home or with friends) to formal savings facilities (such as savings accounts with a financial institution).

savings facilities by rural Pacific Island villagers impact on their welfare?" This evaluation adds to literature by being the first to consider empirically the welfare impact of access to formal savings facilities in a Pacific Island country. It is also the first to consider welfare impacts from the use of formal savings facilities as payment tools. It is hypothesised that welfare will be enhanced when formal savings facilities are used as payment tools and commitment devices, making it 'less difficult' for people living in households with high levels of formal savings to pay for higher value items that fall due periodically, such as seasonal gifts and school fees (i.e. lumpier items).

Results show intervention significantly reduces the difficulty associated with paying for higher value less frequent items (i.e. 'lumpier' items) while it is unlikely to significantly influence the difficulty associated with paying for low value more frequent items. Results also reveal that the reduction in difficulty is felt greatest amongst the 28 percent of households where formal savings facilities have been used as commitment devices to increase household savings levels. Hence the results support the hypothesis.

Second Evaluation

What types of people in developing countries actually demand savings facilities? Given the increased outreach of micro-savings facilities, directing savings facilities to individuals with the strongest demand for such services would be of the greatest benefit. Critically, how could these individuals be identified prior to expanding an expensive development program? One approach is to differentiate between characteristics of people who open savings accounts to those who do not.

A particular characteristic that has been investigated more recently in literature is the concept of time preference. Time preference refers to a person's relative level of patience for items (such as money or goods) over time. If their level of patience remains the same over time, they are considered time-consistent. If they are impatient for items in the near-term but are patient for items in the long-term they are present-biased time inconsistent. If they are patient for items in the near-term but impatient for items in the long-term they are future-biased time inconsistent.

When investigating the impact of time-preferences on individual behaviour, literature has largely focused on the impact of present-biased time inconsistent preferences (Ashraf *et al.* 2006; Meier and Sprenger 2008a). Literature largely argues some people with present-biased time inconsistent preferences are sophisticated enough to understand their self-control problems and take appropriate action. This may involve limiting the amount of their credit access (Meier and Sprenger 2008a) or imposing an earlier deadline than required to submit academic papers (Ariely and Wertenbroch 2002).

A recent paper also demonstrates that *existing* savers with present-biased time inconsistent preferences understand their self-control problems and are more likely to restrict withdrawals by agreeing to deposit money into a savings commitment device (Ashraf *et al.* 2008). However what if the option to save did not exist? Are people with present-biased time inconsistent preferences who do not use formal financial savings facilities likely to demand savings accounts? If this is the case and there are a large number of people with present-biased time inconsistent preferences in a particular area, then it may be financially beneficial for micro-savings organisations to expand access to formal savings facilities into such areas.

This study is motivated by wanting to determine whether people who are sophisticated enough to understand their commitment problems, as demonstrated by their present-biased or future-biased time inconsistent preferences, demand formal savings facilities. If this is indeed the case, and such people form a large percentage of the population, results would support an expansion of access to formal savings facilities.

Hence the second evaluation, of 449 people, follows a quasi-experimental design and asks the research question: "Do time preferences impact on an individual's decision to maintain an open savings account?" This study adds to literature by being the first natural study to investigate whether people's time preferences impact on their decision to maintain an open formal savings facility. Further, this study is the first to consider the impact of future-biased time inconsistent preferences and time-consistent preferences on any form of human behaviour. This is important in the context of recent research that suggests future-biased time inconsistent preferences are more prevalent than present-biased time inconsistent preferences (Sayman and Onculer 2007; Takeuchi 2008). It is hypothesised that people's

present-biased or future-biased time inconsistent preferences, which are indicative of their commitment problems, will significantly impact on their decision to maintain an open savings account.

Results show that the average person who demonstrates present-biased or future-biased time inconsistent preferences is significantly more likely to maintain an open savings account respectively. Hence the results support the hypothesis. Further, the study demonstrates that people with time-consistent preferences are significantly *less* likely to maintain open savings accounts.

Third Evaluation

That print media influences audience perception is not surprising. Instead, what is of interest to researchers is *the extent* to which print-media influences political opinions of its readers and even more critically, how this influences their voting behaviour (Hughes and Lawson 2004; Alsem, Brakman, Hoogduin and Kuper 2008). Understanding this impact is particularly important in countries where elections are won and lost by the slimmest of margins; i.e. would a politician have lost an election if editorial content was slanted more in their favour?

In developed countries, studies have shown that particular newspapers are biased towards certain candidates and biased against others (Erikson 1976; Dalton, Beck and Huckfeldt 1998). However in most of these countries, freedom of expression is vigorously protected and governments do not have significant editorial control over newspapers[10]. Hence any newspaper endorsements are arguably a reflection of editorial perception of candidate suitability[11]. But what of developing countries where state-controlled newspapers have the largest daily circulation? Clearly under these circumstances, journalists have a vested interest in positively depicting their political masters and as a consequence, state-run newspapers can become a propaganda tool for the incumbent government.

[10] For example, in the United States, Australia, the United Kingdom and Norway, governments do not own newspapers.

[11] This statement is debatable because newspaper owners may collude with politicians to write articles favourable to their candidacy (see for example Hughes and Lawson 2004).

In countries such as Sri Lanka, where a state-controlled newspaper has the largest newspaper circulation, voter perceptions may be significantly influenced and the democratic process could be subverted. Determining whether this is the case is important considering that prior elections have been very close; for example, the candidate from the incumbent government in 2009 won the 2005 presidential election by less than 1 percent of the popular vote.

The motivation for this study is to fill a void in literature by determining the extent to which a state-run newspaper in a developing country impacts on voter perceptions. Hence the third evaluation, of 840 people, follows a rigorous experimental design and asks the research question: "Does home delivery of state-run newspapers influence the political opinions of individuals to conform to the views of the state?" This study adds to the literature by being the first experiment to investigate the impacts of state-run newspaper bias in a developing country. It is hypothesised that newspaper bias will significantly influence the political opinions of targeted individuals to conform to the views of the state.

Results show that intervention (i.e. home delivery of state-run newspapers) is effective in significantly influencing the political opinions of individuals to conform to the views of the state across issues that are portrayed positively by state-run newspapers (i.e. successful government initiatives) and across issues that are portrayed negatively by state-run newspapers (i.e. initiatives by opposition parties and other actors running against government policy). Conversely in most cases, people who receive state-run newspapers are not significantly influenced by intervention to conform to the views of the state across issues that are portrayed defensively by state-run newspapers (i.e. unpopular state actions). Hence, the hypothesis is only partially correct.

Summary

Ultimately, the interventions of micro-savings and newspaper bias, illustrated in chapters 3 and 5 respectively, as well as an individual's time preference, highlighted in chapter 4, all have significant impacts on individual or household behaviour albeit not always to the same degree as initially hypothesised. These results may be used as by policy makers involved in expansion of micro-savings facilities and those attempting to improve media freedom.

While the evaluations undertaken in this dissertation contribute to literature across some development issues, they only represent an extremely small fraction of evaluations necessary to address pressing development concerns. Indeed the more rigorous evaluations that are undertaken, and assuming results are understood and recommendations implemented, the more likely practitioners will be successful when engaging in particular development initiatives.

The remainder of the dissertation is structured as follows. Chapter 2 will present a literature review of the three topics considered in the dissertation, a literature review of the methodological designs of each study and a comparison of these designs. Chapters 3, 4 and 5 will focus on the first, second and third evaluations respectively. Each of these chapters will present an introduction, background information (if applicable), the evaluation design, summary statistics, the model used to estimate impact, results, limitations and a conclusion. Chapter 6 will summarise the contribution of the dissertation to literature and offer suggestions for future research.

Chapter 2 – Literature Review

2.0 Introduction

Donor and implementing organisations face many pressing development questions. For instance, should aid organisations support the expansion of micro-savings facilities? This would partially depend on whether an expansion would enhance beneficiary welfare. If formal savings facilities are beneficial, it is important to determine who demands these products so resources can be allocated more efficiently. Hence, organisations may want to determine the characteristics of formal savers. Additionally, do governments of countries, where state-controlled newspapers are circulated most extensively, subvert the democratic process by influencing voters' political opinions using state resources? If yes, aid organisations may increase financial support for independent private media institutions.

Literature uses quasi-experimental and increasingly, experimental designs, to address such development questions. This chapter illustrates and examines examples of studies in areas related to welfare impacts from access to savings facilities, impacts of time preferences on human behaviour and impacts of newspapers on political opinions of individuals. This review will demonstrate voids in current literature and explain how the evaluations undertaken in this dissertation contribute to research.

Further, the more rigorous the methodological designs, the more likely evaluations will accurately estimate impact. Hence, this chapter will also briefly describe the evaluations undertaken in the dissertation and provide example of similar such designs in literature. Importantly, it will also undertake a comparison of the designs to demonstrate the superiority of the experimental design in the evaluation process.

Ultimately, as a result of the literature review, the following three research questions will be investigated in chapters 3, 4 and 5 respectively:

> "Does access to formal savings facilities by rural Pacific Island villagers impact on their welfare?"

"Do time preferences impact on an individual's decision to maintain an open savings account?"

"Does home delivery of state-run newspapers influence the political opinions of individuals to conform to the views of the state?"

This chapter will be separated into three main sections. Section 2.1 will review literature relating to the three evaluations of this dissertation. Section 2.2 will then review literature of methodological designs similar to those used when answering the research questions. A comparison between these designs will then be undertaken in section 2.3.

2.1 Literature Review of the Three Research Questions

The following will review literature relating to each of the three evaluations considered in chapters 3, 4 and 5 respectively.

2.1.1 First Evaluation

This section considers literature relating to welfare impacts of access to formal savings facilities.

Literature suggests formal savings facilities can be used as commitment devices, as reallocation devices, as anonymous vehicles for savings and as payment devices. However, literature largely does not define the welfare implications from such uses of formal savings facilities. This review investigates four potential welfare enhancing qualities from using formal savings facilities as well as reasons why access to formal savings facilities may not be welfare enhancing.

Firstly, when using formal savings facilities as commitment devices, increased welfare is defined as increased levels of savings. Increases in savings levels from using formal savings facilities can occur in an environment with lower fees, stronger economy and higher levels of income (Beck and De la Torre 2007).

There have been some empirical studies using survey level data suggesting that access to formal savings facilities increases savings levels. Aportela (1999) analyses data from between 10,000 and 13,000 households and finds that improved access to savings in certain regions in Mexico increases the average household savings rate by almost 5 percent. The effect was the highest among poorer households. Arpotela's (1999) study relies on comparing areas where a government institution undertook a formal savings expansion program to areas where formal savings was not expanded. Considering that government run programs may be expanded into areas based purely on political preference, there may be unobservable differences in characteristics between areas receiving formal savings facilities and those not receiving formal savings facilities. This may bias results.

A more rigorous study is undertaken by Ashraf *et al.* (2006). Their natural experiment of 1777 micro-savings clients reveals that after one year, access to commitment formal savings facilities, as opposed to formal savings facilities without commitment features, increases savings levels by 81 percent. Given the randomised structure of the study, the results can be considered robust.

As demonstrated by Ashraf *et al.* (2008), another potential welfare implication from using formal savings as a commitment device is that female savers, who access a commitment savings device, are more likely to experience increased feelings of self-empowerment. This is in part demonstrated by a "shift towards female-oriented durables goods purchased in the household" (Ashraf *et al.* 2008:4). The study is an extension of Ashraf *et al.* (2006) and again, due to its randomised nature, can be considered robust.

Access to formal savings facilities may also increase savings levels through an increased inflow of remittances as formal savings facilities provide a positive rate of return, thus encouraging migrants to remit their money[12] (Quinn 2005).

Secondly, when using formal savings facilities as reallocation devices, increased welfare is defined as the increased discipline savers have over their own savings and expenditure patterns. Due to the temptation to spend money, people may 'reallocate' savings from

[12] It is uncertain if this applies in situations where interest rates are very low which is generally the case with micro-savings institutions.

informal savings to formal savings facilities to prevent them from accessing money that is readily available in the home. This reallocation process encourages deposit discipline (Vonderlack and Schreiner 2002) while further discipline could be provided through opting for withdrawal restrictions (Ashraf *et al.* 2004).

Ashraf *et al.* (2004) use an example of a microfinance institution in the Philippines that sells a locked box for a small fee to encourage deposit discipline and withdrawal restrictions. Clients periodically go to the bank to deposit money. Withdrawal restrictions also impose discipline on clients. For example, clients could opt to restrict withdrawals until an important date, such as a birthday or Christmas, or alternatively, restrict withdrawals until a certain goal was met, such as accumulating enough for livestock purchases. Importantly withdraws can also occur in case of particular emergencies, such as medical fees for children, a death in the family or to purchase an important asset.

However while Vonderlack and Schreiner (2002) and Ashraf *et al.* (2004) provide examples of potential benefits from using formal savings facilities as reallocation devices, their claims are not founded on rigorous evaluation designs.

Thirdly, when using formal savings facilities as anonymous vehicles for savings, increased welfare is defined as the increased financial independence of savers. Specifically, formal savings facilities provide the poor with anonymous access to "convenient, liquid and safe deposit services which are protected against inflation by positive real rates of interest" (Conroy 2006:19). The anonymity provides financial independence as other people are unaware of savings balances. Conversely, informal savings facilities suffer from low safety, negative returns, limited access to funds and no anonymity (Vonderlack and Schreiner 2002). For example, people who save in community groups, such as through rotating savings and credit associations, are aware of each others' balances and may not be able to withdraw as and when required (Aghion and Morduch 2005). Further, other assets, such as jewellery, radios, cattle, cows, rice and corn kept at home can be stolen and do not generate positive interest.

There appears to be no study that empirically evaluates whether using formal savings facilities as anonymous vehicles for savings is welfare enhancing.

Finally, when using formal savings facilities as payment tools, increased welfare is defined as the reduced difficulty in paying for household expenses. There are examples in literature that claim formal savings facilities are used as payment tools. For instance, Aghion and Morduch (2005) propose the poor may accumulate daily inflows into large lump sum payments for particular items such as children's school fees, presents for Christmas, an emergency or for other non-monetary assets such as purchase of agricultural equipment. They may also "save small amounts at frequent intervals to smooth income" (Ashraf, Gons, Karlan and Yin 2003:4) and hence ensure sufficient funds are available to pay for necessary consumables when experiencing "income shocks or unexpected increases in expenditures" (Zeller and Sharma 2000:160). Examples of rural people who may choose to smooth income are those who receive remittances as income[13] (Conroy 2006) and farmers who earn volatile incomes from crop production and livestock sales (Zeller and Sharma 2000).

There is some empirical evidence to support such claims. A study of financial records kept by 42 households in Bangladesh by Rutherford (2002) demonstrates that households save to build lump sums of money for immediate expenditure as opposed to accumulating for long-term savings. Unfortunately, given the small sample size and lack of any comparison group, these findings are unlikely to be robust. Further, while literature claims formal savings facilities are used as payment tools, there is no empirical study that considers whether using formal savings facilities as payment tools improves welfare by reducing the difficulty involved in paying for household expenses.

In Pacific Island countries, Flaming and Mathison (2007:iv) argue populations "are eager to access savings instruments when they can do so readily and without great cost". Flaming and Mathison (2007) present the example of Vanwods in Vanuatu and ANZ bank in Fiji that provide formal savings facilities to rural communities by directly approaching people in villages. Flaming and Mathison (2007:11) claim clients of Vanwods are net savers while ANZ bank has experienced "robust response to its mobile branch savings initiative in Fiji".

[13] Remittances are transfers of money by foreign workers to their home countries.

Further, in Pacific Island countries, Cornford (2001) believes access to savings can be useful while Conroy (2006:7) argues "the importance of savings is underestimated". Conroy's study of micro-savings in Pacific Island countries suggests Pacific Islanders "demonstrate a surprisingly high propensity to save" (Conroy 2006:23). He uses non-monetary examples such as tuber crops, which can be harvested over a period of time, can be consumed now, or 'saved' for future consumption. Conroy (2006:34) concludes "in the Pacific, the strongest argument for the extension of savings services is that rural and low-income people so manifestly want it". Nevertheless, despite these claims, there appears to be no empirical research in Pacific Island countries investigating whether savings does indeed enhance welfare.

There are reasons why rural communities in developing countries may not save despite having access to formal savings facilities. One reason is that they may be unable to forgo current income for future income (Ashraf *et al.* 2003) especially in adverse economic climates. Additionally there may be cultural and historic reasons why communities chose not to save. For example, Dunn and Arbuckle Jr. (2001:184) illustrate a case where respondents believed "money shouldn't be put away" and instead used to purchase enterprise inventory. In another instance, Dunn and Arbuckle Jr. (2001) highlight clients who lost savings due to banks becoming insolvent. This in turn resulted in a mistrust of banks and dissuaded such clients from saving.

Additionally people with formal savings facilities with little formal education may be overwhelmed with financial concepts completely foreign to them and fail to understand "the possibility of services they have never encountered" (Flaming and Mathison 2007:iv). This is particularly relevant to populations in Pacific Island countries who have "accumulated wealth and conducted transaction without using financial institutions for generations" and as a result "these patterns are ingrained in household money management practices" (Flaming and Mathison 2007:4). Hence such people "are likely more influenced by their traditional perceptions than by financial calculations" (Flaming and Mathison 2007:4).

So is access to formal savings facilities welfare enhancing? With the exception of investigating welfare impacts when using formal savings facilities as a commitment device,

there appears to be no natural field study investigating welfare impacts due to formal savings being used as reallocation tools, as vehicles for anonymous savings or as payment devices. Hence, the study in chapter 3 contributes to literature by being the first to undertake a natural field study to determine whether welfare is enhanced when formal savings facilities are used as payment tools to reduce the difficulty involved in paying for household expenses. It is also the first to consider whether formal savings facilities are used mainly as a commitment tool or reallocation tool and is the first micro-savings evaluation focusing on a Pacific Island country.

2.1.2 Second Evaluation

This section initially provides a brief explanation of time preferences. It then undertakes a review of literature relating to the impact of present-biased time preferences on an individual's behaviour.

Explanation of Time Preferences

Inter-temporal choice behaviour involves consideration of "tradeoffs between current and future rewards" (Laibson 2003:2). The components of inter-temporal choice are separated into both diminishing marginal utility and the discount function. The discount function is used to explain time preferences. Hence, the discussion relating to time preferences will be developed after briefly considering inter-temporal choice.

Frederick and Loewenstein (2002) note literature on inter-temporal choice behaviour dates as far back as John Rae's seminal publication of the Sociological Theory of Capital in 1834. Rae argues differing wealth between nations was perpetuated in part due to differences in the effective desire to accumulate (cited in Frederick and Loewenstein 2002). He also explains this desire varies over time with immediate pleasures far more desirable than delayed pleasures. Böhm-Bawerk (1889) expands on Rae's work by explaining people underestimate future wants and as a result allocate consumption differently across periods. Samuelson (1937) formalises this preliminary work by incorporating inter-temporal choice into the discounted utility module (refer equation 2.1).

$$U(x) = \sum_{t=0}^{T} D(t)u(x_t) \qquad \text{Eq 2.1}$$

U(x) represents the sum in the present period of all of the discounted present values of future utilities that will result from a decision today that generates payoffs 'T' periods into the future. $u(x_t)$ represents the instantaneous utility derived at time 't' when consuming bundle 'x'. The rate at which this utility at time 't' is discounted to the present is captured by the discount function, *D(t)*.

There are two main forces in equation 2.1; diminishing marginal utility and the discount function. An individual is likely to spread consumption over time due to the concept of diminishing marginal utility; that is at any point in time, for every extra unit of consumption, utility increases at a decreasing rate. Hence;

$$u'(x) > 1 \qquad u''(x) < 1$$

In the discounted utility model (eq 2.1), the discount function ($D(t) = \delta^t$) has a constant discount factor (δ). This discount factor "measures the value of a discounted utility" (Laibson 2003:12). The discount factor is in turn a function of the discount rate 'k' where

$$\delta = \left(\frac{1}{1+k}\right) \qquad \text{Eq 2.2}$$

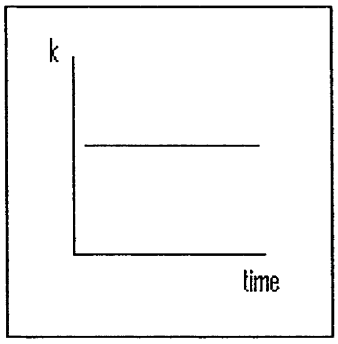
Thus "the discount rate measures the rate of decline of the discount function" (Laibson 2003:12).

Equation 2.1 can be expanded as follows:

$$U(x) = u(x_0) + \delta u(x_1) + \delta^2 u(x_2) + \delta^3 u(x_3) + ... + \delta^T u(x_T) = \sum_{t=0}^{T} D(t)u(x_t) \qquad \text{Eq 2.3}$$

Many economists continue to assume a constant discount factor (O'Donoghue and Rabin 1999). Hence 'k' is constant over time (refer figure 2.1).

Figure 2.1: Constant Discount Factor

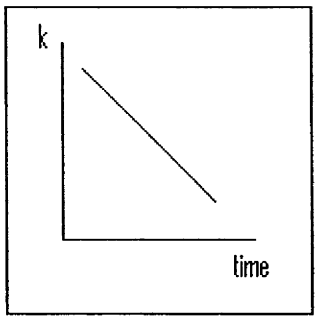


This constant discount rate implies a person's inter-temporal preference is time-consistent where later preferences confirm earlier preferences (Frederick and Loewenstein 2002); hence preferences do not change over time. To illustrate, assume an individual has a choice between an immediate reward and a relatively larger delayed reward in both the near-term and distant-term. Now assume the individual is asked the near-term question "would you prefer $400 now or $500 in one month's time?" and the distant-term question "would you prefer $400 in six months time or $500 in seven months time?" where the $400 in each question refers to the immediate reward and the $500 in each question refers to the delayed reward[14]. A person who wants the smaller immediate reward in both the near-term and the distant-term is impatiently time consistent. Conversely a person who is willing to wait for the relatively larger delayed reward in both the near term and distant term is patiently time consistent.

However a broad body of literature contends the concept of time consistency is oversimplified as people's actions imply their discount rates change over time (Laibson 1997; Thaler 1981). In most cases, literature proposes that people are likely to be time inconsistent where discount rates generally decrease over time (Laibson 2003; Frederick and Loewenstein 2002; Ashraf *et al.* 2006). In equation 2.3 it implies 'k' decreases over time and hence δ increases over time. This is illustrated in figure 2.2.

[14] In quasi-experimental and experimental studies, people may either be asked this question hypothetically or provided with actual rewards over time.

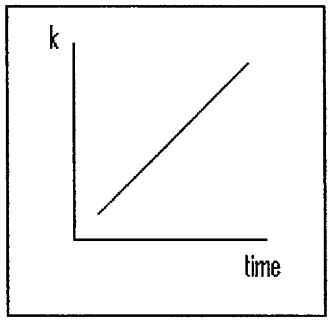
Figure 2.2: Decreasing Discount Factor



Thus the discount factor attaches a greater relative weight to utility over time (Streich and Levy 2007). These individuals who want immediate rewards in the near term, but are willing to wait for delayed rewards in the distant term are present-biased time inconsistent[15] (Ashraf *et al.* 2006).

Conversely there is also some evidence that people delay rewards in the near-term for larger rewards in the distant term. In equation 2.3 it implies 'k' increases over time and hence δ decreases over time. Ashraf *et al.* (2006:647) claim this future-biased inconsistency may occur if "an individual is flush with cash now, but foresees being liquidity constrained in six months". This is illustrated in figure 2.3.

Figure 2.3: Increasing Discount Factor



[15] Note the term hyperbolic time preferences may be used interchangeably with present-biased time preferences.

If a person is time inconsistent they are patient in the near-term and impatient in the distant-term (present-biased) or impatient in the near-term and patient in the distant-term (future-biased). Refer to table 2.1 for a summary of time preferences.

Table 2.1 - Matrix Outlining Time Preferences

		Distant Term Question	
		Immediate Reward Selected	**Delayed Reward Selected**
Near Term Question	**Immediate Reward Selected**	Impatiently time consistent	Present-biased time inconsistency
	Delayed Reward Selected	Future-biased time inconsistency	Patiently time consistent

Literature Review for Second Evaluation

Strotz (1955) was the first to argue people want immediate rewards in the near term but are willing to wait for delayed rewards in the distant term and as such demonstrate present-biased time preferences. Since then many models using available data corroborate the concept of present-biased time preferences (see for example Streich and Levy 2007).

Indeed some studies also support the concept of present-bias. For example, Thaler (1981) undertakes a study using data gathered from hypothetical monetary time preference questions asked from 80 University of Oregon students. He explains "the psychophysics of time suggests that the difference between today and tomorrow will seem greater than the difference between a year from now and a year plus one day" (Thaler 1981:205). Thaler (1981) notes this reveals a 'time effect' where discount rates decrease over time.

Benzion, Rapoport and Yagil (1989) undertake a similar study using data gathered from hypothetical monetary time preference questions asked from 204 students in the University of Haifa. Results demonstrate given minor exceptions, the mean discount rates decrease over time (Benzion *et al.* 1989). These results are consistent with findings by Thaler (1981).

More recently, there has been a steady increase in empirical studies illustrating the prevalence of future-biased time inconsistency. For instance Sayman and Onculer (2007) undertake a series of empirical studies using real rewards in longitudinal analysis and hypothetical rewards in cross-sectional analysis to measure discount rates. The sample sizes range from 47 subjects to 72 subjects across the studies. They find that the shorter the time period between the near term and distant term rewards and between the immediate and delayed rewards, the more likely people will be future-biased. Another recent study by Takeuchi (2008) investigates discount rates using hypothetical rewards in a longitudinal analysis across 56 subjects. He finds that people demonstrate future-bias in approximately 66.6 percent of cases.

Why this divergence in literature? Takeuchi (2008) argues when using hypothetical questions to estimate time preference, the studies advocating future-bias provide multiple future options while the studies advocating present-bias only provide an option between one immediate reward and one future reward. Further, the distance between the near term and distant term rewards is generally greater in the studies advocating present-bias time preferences.

While most studies focus on time-inconsistent preferences, there has been one paper specifically advocating the prevalence of time consistency over time inconsistency. Fernandez-Villaverde and Mukherji (2006) undertake a study estimating the time preference of 23 undergraduate students with results rejecting time inconsistency. However, a limitation of this study is that it is unlikely 23 subjects represent a sufficiently large sample size. The studies undertaken by Thaler (1981) and Benzion *et al.* (1989) have samples of 80 and 204 people respectively. Interestingly, results of other studies have indirectly demonstrated that time consistency occurs more frequently than time inconsistency however this phenomenon has not been discussed extensively within the papers (Read and Van Leeuwen 1998; Meier and Sprenger 2008a).

When considering the ability of time preferences to predict human activities, literature has largely confined itself to determine whether people with present-biased time preferences are sophisticated enough to act on their self-control problems. This is primarily because

most literature argues that present-bias time preferences are the most prevalent (Frederick and Loewenstein 2002).

The papers by Meier and Sprenger (2008a) and Ashraf *et al.* (2006) consider the influences of present-biased time preferences. For example, Meier and Sprenger (2008a) find people with present-biased time preferences have higher credit card borrowing levels. They measure the time preference of 541 people in two neighbourhoods in the United States using answers to hypothetical time preference questions. Results show that some people with time-commitment problems (as demonstrated by their present-biased time preferences) are sophisticated and restrict their borrowings while others are naïve, and increase their borrowing.

Ashraf *et al.* (2006) undertake an experimental design in the Philippines investigating impacts of present-biased time preferences on people's decision to engage in a commitment savings product. Hypothetical time preference questions were asked from a sample of 1777 existing or former clients of which a randomly selected subset of 710 people were offered a commitment product. Analysis on these 710 clients indicates women with present-biased time preferences are significantly more likely to open a commitment savings account. Further Ashraf *et al.* (2006) find evidence that the product assisted women to overcome self-control problems and led to improved savings practices.

Most studies investigating impacts of time preferences only focus on the influence of present-biased time consistency. However this literature review has highlighted examples of different studies supporting the prevalence of present-biased time consistency, future-biased time consistency *and* time consistency. Hence the study in chapter 4 adds to the literature by being the first to consider the impacts of future-biased time inconsistency and time consistency on human behaviour (i.e. maintaining an open savings account). Further, the study in chapter 4 is also the first to consider whether *people's* present-biased time preferences, demonstrating their commitment problems, impact on their decision to maintain an open savings account[16].

[16] Recall Ashraf *et al.* (2006) investigates whether *savers* with commitment problems are likely to choose a separate savings commitment device.

2.1.3 Third Evaluation

This section considers literature relating to whether media, and in particular newspapers, impact on the political opinions of individuals.

There exist a broad body of literature investigating the impacts of media on political opinions. One of the earlier studies suggest that mass media (defined as television, radio, film, recorded music, newspapers, magazines and literature by Mankekar 1993) did not have a strong effect on changing the opinions of voters (Lazarsfeld, Berelson and Gaudet 1948). However, most subsequent literature points to a positive relationship between mass media and political opinions. For instance, McCombs and Donald (1972:176) suggest "the evidence is much stronger that voters learn from the immense quantity of information [from the mass media] available during each campaign". Atkin (1978) concurs, claiming young people increase their political knowledge after exposure to mass media. Further, as cited in Strongberg (2001), Stromberg (1999a) argues that mass media influences a forward-looking electorate as it enables voters to view the promises being made by politicians while Stromberg (1999b) claims it also influences a backward-looking electorate as it allows voters to assess whether promises have been kept.

Recently, there has been a body of literature focusing on the impacts of television on influencing voter opinions. DellaVigna and Kaplan (2006) find the conservative Republicans gain 0.4 to 0.7 percentage points in towns that broadcasted the conservative Fox News. Gentzkow and Shapiro (2004) claim people's opinions on the politics behind 9/11 vary depending on whether they were exposed to CNN or Al Jazera. During a laboratory experiment, (Ansolabehre and Iyengar 1995) argue political slanted advertisements on television influenced 8 percent of subjects to change their views. Similarly, Brians and Wattenburg (1996) suggest political advertisements influence the opinions of certain people.

There has also been analysis on the impacts of media in developing countries. Johnson (2001) shows television generates greater political awareness for people in remote Indian villages. In Malaysia and Singapore, access to the internet has encouraged people to engage in more politically contentious journalism (George 2005). In Nigeria, Ojo (2003)

suggests mass media is an important tool to ensure a political culture evolves as people become more aware of the government's past actions and future intentions. Further, Janda, Berry and Goldman (1992) argue to support democracy in developing countries "the mass media provide the main channels for [a] two-way flow of information and therefore have the dual capability of redefining and shaping our political views" (cited in Ojo 2003).

Hence there has been much literature suggesting that media in general influence political opinions. Further, it is well known that newspapers influence political opinions of individuals (Dalton *et al.* 1998; Hughes and Lawson 2004; Druckman and Parkin 2005; Alsem *et al.* 2008). Clearly, this is one of the primary objectives of newspapers. Hence literature largely investigates to what *extent* newspapers influence political opinions of individuals.

For instance, Besley and Burgess (2002:12) use an economic model in India to find that "higher newspaper circulation is associated with government being more responsive to falls in food production and flood damage". They model data between 1958 and 1992 from sixteen major Indian states when creating their results.

Besley and Burgess (2002) include a vector of economic, political and media variables that may also influence government responsiveness in their analysis. However, they have not captured any unobservable variables and are unlikely to have captured all observable variables that may influence their dependent variable. Hence, a major weakness with such analysis is that it may suffer from omitted variable bias; i.e. the failure to include all variables that influence the dependent variable in the regression.

If governments are influenced, it is not surprising literature also demonstrates that newspaper content influences political opinions of individual citizens. An early study by Miller, Goldenberg and Erbring (1979) find that readers of highly critical newspapers were more distrustful of their governments. Further, Erikson (1976) and Robinson (1974) document "a direct relationship between newspaper endorsements and the voting patterns of readers" (Dalton *et al.* 1998:112). More recent empirical evidence points to a general positive correlation between newspaper bias and political opinions. For example, the study by Dalton *et al.* (1998) involves telephoning 1318 people across 40 United States counties

regarding their political opinions and what newspapers they read. Results of the study's econometric model, which control for party affiliations, find that "a newspaper's editorial content is significantly related to candidate preferences" (Dalton *et al.* 1998:111). However, like Besley and Burgess (2002), Dalton *et al.* (1998) may suffer from omitted variable bias as it does not control for other media, such as television and radio, which may also influence individual's political preferences.

A study by Druckman and Parkin (2005) also demonstrates editorial content influences voter perception. As opposed to Dalton *et al.* (1998), Druckman and Parkin (2005) focus on two competing newspapers in one county in the United States. They measure relative slant of each newspaper by "comparing relative coverage of two candidates by a single outlet and relative coverage of the candidates by competing outlets" (Druckman and Parkin 2005:1031). This 'slant' is considered by both the space allocated to each candidate and the tone of comments, which can be either positive, negative, or neutral in relation to a particular candidate.

Unlike Dalton *et al.* (1998), Druckman and Parkin (2005) illustrate that the average reader of each newspapers used in their study are similar across a vector of demographic and political characteristics. Nevertheless, by their own admission, Druckman and Parkin (2005) concede they may still suffer from omitted variable bias.

While most of the literature points to a positive correlation between newspaper bias and political opinions, Gerber, Karlan and Bergan (2009) indicate the influence of newspaper bias on viewers' perception is insignificant. Gerber *et al.* (2009:35) undertake a randomised study "to measure the effect of political news content on political behavior and opinions" in a United States county. The study involves selecting a group of households in a particular district who were not exposed to home delivered newspapers. It then randomly issues liberal newspapers to some households, conservative newspapers to other households and no newspapers to remaining households. Ten weeks later, political questions were asked from 1081 people in households across these three groups.

Results indicate among all newspaper recipients, that although media slant did not change political opinions, greater media exposure resulted in increased support for the Democratic

candidate. Gerber *et al.* (2009) justify this result by suggesting while the papers covered news differently, all reported on negative political controversies. As opposed to Dalton *et al.* (1998), Besley and Burgess (2002) and Druckman and Parkin (2005), Gerber *et al.* (2009) randomise using a large sample size. Hence the study by Gerber *et al.* (2009) does not suffer from omitted variable bias and the methodology can be considered robust.

While this literature has generally demonstrated that bias from *newspapers* influences the political opinions of individuals, there is little empirical research investigating the impacts of state-run newspaper bias. More broadly, non-empirical based literature suggests bias due to state-controlled *media* influences voter perception. For instance, former Russian President Putin's popularity remains high in part because his administration tightly monitors the media (Stoner-Weiss 2007) while in Malaysia, the ruling party has created and reinforced numerous mechanisms to ensure an obedient media that will not jeopardize the status quo (Lim 2007).

All the empirical studies considered in this literature review use more than one newspaper to assess impact. Recall, Dalton *et al.* (1998) analyse newspapers in 40 counties in the United States, Besley and Burgess (2002) analyse 16 newspapers in India across 34 years while Gerber *et al.* (2009) use two newspapers in their study. This is generally undertaken to demonstrate that different newspapers have varying points of view which in turn influence readers in specific ways. Conversely, the study in chapter 5 of this dissertation focuses on the impact of home delivery of *a* newspaper that is state-controlled, and hence carries with it an implicit bias to promoting the actions of the state. Hence impact on political opinions can be measured through analysing whether various state goals, such as security and economic prosperity, have been positively perceived by a group of people who have received state-controlled newspapers.

The study in chapter 5 adds to literature by being the first experiment investigating impacts of newspaper bias in a developing country. Considering people in developing countries are less likely to have access to a variety of points of view in the media relative to developed countries, understanding the impact of newspaper bias takes on added importance.

2.2 Methodological Designs

The following section considers methodological designs similar to those used when investigating the three research questions of this dissertation. Section 2.2.1 relates to the first evaluation, section 2.2.2 relates to the second evaluation while section 2.2.3 relates to the third evaluation.

2.2.1 Methodological Design used in the First Evaluation

Alexander-Tedeschi and Karlan (2009) argue in microfinance impact assessments driven largely by cost-factors, it is likely older groups are compared to newer groups at a cross-sectional level (see for example MkNelly and Lippold 1998, Copestake, Bhalotra and Johnson 2001 and Niño-Zarazúa 2007). This approach is also taken when the methodological design is developed after program implementation. However in most cases the studies cannot prove when older groups were initially offered intervention, the average older group member was statistically identical to the average newer group member (who had not yet received intervention). Hence any analysis between the average older group member and average newer group member a year post-intervention will suffer from omitted variable bias. Ultimately, such evaluations trade rigor for pragmatism. The cross-sectional quasi-experimental design of the first evaluation follows this structure.

Study Design for First Evaluation

The following provides an example of the post-test only quasi-experimental design similar to that used in chapter 3 of the dissertation.

At time 1, an organisation chooses 'x' out of '(x + n)'[17] groups to be offered intervention (note each 'group' represents a cluster of people) based on some observable or unobservable characteristic. Thus 'x' groups are offered treatment while 'n' groups are not. As everyone is eligible for intervention within groups, some people within groups 'x' choose intervention and are considered 'older clients' (or treatment group clients) while others refuse intervention are considered older 'non-clients'.

[17] 'x' and 'n' are positive integers.

At time 2, the organisation offers intervention to the remaining 'n' groups. The people accepting intervention are considered 'newer clients' (or control group clients).

Variations of the model in equation 2.4 are generally used to measure impact and involve comparing output variables, controlled by observable characteristics, between treatment group clients and control group clients (Aghion and Morduch 2005; Niño-Zarazúa 2007).

$$Y_{ij} = c + \alpha D_j + \alpha_2 X_{2ij} + \varepsilon_{ij} \qquad \text{Eq 2.4}$$

In the model, 'i' denotes the individual observation while 'j' indexes a group T (treatment) or C (control). Y_{ij} represents an output variable for individual 'i' in group 'j' at time 2. X_{2ij} represents the vector of time-invariant observable characteristics for individual 'i' in group 'j' potentially correlated with output variable Y_{ij}. D_j represents a treatment dummy variable which equals one for clients in treatment groups. Impact is measured by analysing the coefficient of the dummy variable.

Equation 2.4 is mis-specified as it fails to account for omitted variables; unobservable and observable characteristics that may be correlated with the dependent variable. If omitted variables are positively (negatively) correlated with the dependent variable, it would create upward (downward) bias in results.

Review of Literature relating to the Methodology used in the First Evaluation

The bias due to omitted variables largely exists due to problems associated with non-random program placement and selection bias.

Non-random program placement occurs when, for reasons observable or unobservable to the researcher, the organisation chooses particular groups (group 'x'), but not others (group 'n'), for initial intervention. If this reason is correlated with output variables, then impact estimation using equation 2.4 will be biased.

Morduch (1998) argues bias evolving from non-random program placement can occur if vendors have pre-selected a treatment group over a control group for a particular reason.

Pitt and Khandker (1998) use the example that microfinance impact would be underestimated if vendors select high poverty areas and comparisons are made with low poverty areas. Conversely vendors may only fund relatively richer treatment villages, thus overestimating microfinance impact if compared to very poor control villages. As a result non-random program placement is a "serious issue" (Khandker 2001:6) and has the potential to create an upward or downward bias.

Additionally cross-sectional quasi-experimental designs may suffer from selection bias. Selection bias would occur if the characteristics of people initially receiving intervention (i.e. clients in groups 'x') were different from those selected from people receiving intervention at a later date (clients in groups 'n') and these characteristics were correlated with output variables. Selection bias can also be significant. In the Dunn and Arbuckle Jr. (2001) study, estimating the impacts of micro-credit, output variables of 'old clients' were compared to 'non-clients' with similar characteristics to older clients. Alexander-Tedeschi and Karlan (2009) show that impact in the Dunn and Arbuckle Jr. (2001) study may be overestimated as pre-intervention, 'non-clients' were poorer than 'older' clients.

Observable characteristics can be, to an extent, used to mitigate this non-random program placement and selection bias and "overcome the lack of pretest measures" (Cook 1979:99). Bamberger *et al.* (2006:220) concurs, arguing "the analytical power of the design can be strengthened through the use of multivariate analysis to statistically control for differences between the two groups". Nevertheless, in cross-sectional quasi-experimental designs it is very difficult to account for unobservable characteristics[18].

There are some examples in literature of cross-sectional quasi-experimental designs comparing older groups to newer groups that implicitly considers bias from non-random program placement and selection bias. One such study, by Niño-Zarazúa (2007), estimates impacts of micro-credit on income poverty in Mexico. The study compares an older group

[18] Some unobservable characteristics can be controlled for using appropriate instruments. In longitudinal studies, influence of time-invariant unobservable characteristics can be eliminated through a difference in difference approach. Note however, if errors in the regressions at time 1 are different to the errors in regressions at time 2, measurement error will exist; i.e. the difference in difference estimator has not 'differenced' out identical errors. Measurement errors are a common problem in quasi-experimental panel analysis (Wooldridge 2001) and while IV techniques can be used to address this issue (see for example Galvo, Jr. and Montes-Rojas 2009), problems may still persist.

of lenders actively participating in the credit program to a newer group of lenders who have self-selected to participate and have been accepted by the lender but only received a loan after the survey was completed.

To account for non-random program placement, the study selects people from "households living in the same settlement ... in order to hold constant factors such as infrastructure, cost of inputs and local prices" (Niño-Zarazúa 2007:5). Selection bias is addressed by comparing old lenders actively participating in the credit program to new lenders who 'self-selected' to participate pre-intervention, and had been accepted by the lender when old lenders were given loans, but only received a loan after the survey was completed. Consequently pre-intervention, both old and new lenders had similar characteristics (i.e. those encouraging them to 'self-select' into the program).

However Niño-Zarazúa (2007) fails to address if there was a reason, unobservable to the researcher, why the lender chose to initially issue loans to old lenders over new lenders. If such a reason exists and it is correlated with the dependent variable (income), results may be upwardly biased.

An earlier study by Pitt and Khandker (1998) also undertakes a cross-sectional quasi-experimental design. The study estimates the impact of micro-credit by comparing output variables from a sample of households in villages where banks were providing micro-loans, to output variables of sampled households in villages where these banks were not operating.

To account for non-random program placement, Pitt and Khandker (1998) uses a vector of observable characteristics to demonstrate that treatment villages were on average, statistically similar to control villages pre-intervention. To reduce bias from selection of program participants, Pitt and Khandker (1998) assesses the impact of intervention on households that were eligible for loans in treatment and control villages, thus including clients and eligible non-clients in the study. Hence theoretically, the study compares groups of people with similar characteristics.

However, eligibility requirements in the Pitt and Khandker (1998) study were not strictly followed and people who were ineligible for loans (i.e. wealthier people) were receiving

them (Morduch 1998). Consequently as people selected to newer groups strictly adhered with eligibility criteria while people in the older groups did not, comparisons between older and newer groups overstated impact. Further, while observable characteristics at village level were considered, there may have been reasons unobservable to the researcher why the lender chose certain villages over others. If this occurred, then non-random program placement would also bias results.

Clearly non-random program placement and selection bias can be problematic in cross-sectional field studies. Consequently, the cross-sectional design used in the study in chapter 3 considers issues relating to non-random program placement and selection bias in the chapter's methodological design section and demonstrates potential bias in the ensuing results.

Additionally, even if these issues are addressed, there may be other omitted variables, such as unobservable characteristics and time variant observable characteristics, correlated with the dependent variable and not included in the analysis. This is an inherent limitation in cross-sectional designs of this nature.

2.2.2 Methodological Design used in the Second Evaluation

The methodological design used for the second evaluation is a cross-sectional quasi-experimental design where the characteristics of people who self-selected and opened savings accounts (clients) are compared to people who chose not to open savings accounts (non-clients).

Study Design for Second Evaluation

The following provides an example of a cross sectional study similar to that used in chapter 4 of the dissertation. At time 1, an organisation offers a program to all people within a group. 'Clients' accept this program while 'non-clients' choose not to participate in the program and remain clients and non-clients respectively at time 2. At time 2, a cross-sectional survey is undertaken of clients and non-clients.

The analysis in chapter 4 focuses on the impact of time preferences on an individual's decision to maintain an open savings facility. The model in equation 2.5 illustrates the impact of time-*in*consistent preferences on a person's decision to maintain an open savings facility.

$$P_i = c + \alpha I_i + \alpha_2 J_i + \alpha_3 X_{2i} + \varepsilon_{1i} \qquad \text{Eq 2.5}$$

'P_i' is a dummy variable equalling one if individual 'i' is a client or zero if they are a non-client. 'I_i' represents a dummy variable which equals one when individual 'i' demonstrates present-biased time consistency and zero otherwise. 'J_i' represents a dummy variable which equals one when individual 'i' demonstrates future-biased time consistency and zero otherwise. X_{2i} represents a vector of observable characteristics for individual 'i' potentially correlated with 'P_i'. Impact of present-biased time consistency and future-biased time consistency is measured by analysing the coefficient of the dummy variables 'I_i' and 'J_i' respectively.

The model in equation 2.6 illustrates the impact of time-consistent preferences on an individual's decision to maintain an open savings facility.

$$P_i = c + \alpha L_i + \alpha_3 X_{2i} + \varepsilon_{2i} \qquad \text{Eq 2.6}$$

All variables are as previously indicated. 'L_i' represents a dummy variable which equals one when individual 'i' demonstrates time consistency and zero otherwise.

Critically, as all clients and non-clients were eligible to participate in the program, non-random program placement is not problematic. Further, as clients and non-clients self-selected their respective position, selection bias is also not problematic.

Nevertheless, as the analysis uses observable characteristics gathered at time 2, it can only include time-invariant observable characteristics in the analysis, thus failing to capture all observable characteristics that may encourage program acceptance. Additionally, the regression fails to consider other unobservable characteristics that may encourage program

acceptance. This is a limitation faced by other studies using similar cross-sectional designs (see for example Meier and Sprenger 2008b).

Review of Literature relating to the Methodology used in the Second Evaluation

There are few studies investigating the impact of hyperbolic time preferences on behaviour. The study by Ashraf *et al.* (2006) uses a randomised approach to estimate the impact of hyperbolic preferences on take up of commitment devices. However the selection of participants in the study in chapter 4 is non-random and is consequently similar in design to two cross-sectional studies by Meier and Sprenger (in particular to Meier and Sprenger 2008b).

Meier and Sprenger (2008a) initially select 606 low to moderate income earners with subprime borrowings from two Volunteer Income Tax Assistance (VITA) sites in Boston, Massachusetts to determine whether people with present-biased time preferences can partially explain credit card behaviour. Critically while authors claim the study is a "large field experiment" (Meier and Sprenger 2008a:2), there is nothing to suggest these 606 participants were randomly selected from a group of people within the two VITA sites. Further, there is no explanation as to why these sites were selected over the other 20 VITA sites in Boston. Hence as examination of hyperbolic preferences only focuses on these non-randomly selected 606 participants, the study more likely resembles a field quasi-experimental study as opposed to an experimental study.

The design of another study by Meier and Sprenger (Meier and Sprenger 2008b) most closely resembles the evaluation design used in chapter 4 of this dissertation. Meier and Sprenger (2008b) offered free credit card counselling advice to approximately 870 individuals who attended a VITA site in Boston, Massachusetts. Of these people, 55 percent *self-selected* and accepted counselling. Results demonstrate hyperbolic preferences impacts on a person's decision to accept credit card counselling advice.

Importantly while the 870 individuals represent all people who entered the VITA site during the time of study, only one out of 22 potential VITA sites was selected. Hence people used in the study are only representative of a small section of Boston,

Massachusetts. Such inability to emphatically generalize findings to other regions is a limitation of other quasi-experimental designs (see for example Niño-Zarazúa 2007).

2.2.3 Methodological Design used in the Third Evaluation

The methodological design used for the third evaluation is an experimental design that is planned in advance (*ex-ante*) and impact is measured *ex-post*.

Broadly, literature argues given a choice between quasi-experimental and experimental designs, the latter present the most rigorous choice. Trochim (2006) contends experimental designs are often cited as the strongest method for determining the net impact of a specific treatment or intervention. Lipsey and Cordray (2000:345) concur, claiming in many cases[19], "experimental design is the method of choice for establishing whether social interventions have ... intended effects".

Study Design for Third Evaluation

The following provides an example of an experimental study similar to that used in chapter 5 of the dissertation. At time 1, from a sample of potential groups, some groups are randomly selected for an intervention (these become treatment groups) while intervention is withheld to other groups (these can become control groups). As program placement is randomly selected, on average, the characteristics of treatment and control groups are statistically similar pre-intervention. Further, within these treatment and control groups, individuals are randomly selected for intervention. The randomisation process suggests that the average person in treatment groups is statistically similar to the average person in control groups pre-intervention. Hence selection bias is also not problematic. A survey is taken of treatment and control group members at times 1 and 2.

The randomisation process in experimental designs is designed to ensure pre-intervention at time 1, observable and unobservable characteristics of the average participant in treatment groups are the same as those in control groups. Post-intervention at time 2, the only difference, on average, between treatment and control groups should be due to intervention.

[19] Clearly, there are limitations to randomised designs (see for example Deaton 2009 and Ravollian 2009). However, they are superior to quasi-experimental designs in reference to their internal validity.

Thus, controlling for observable and unobservable characteristics is unnecessary as they are statistically similar between the average control and treatment member.

To measure impact, the following fixed effects OLS equation is regressed:

$$Y_{jvt} = a_{jv} + \gamma_1 Time_t \, X \, Treatment_v + \beta_1 Time_t + \mu_{jvt} \qquad \text{Eq 2.7}$$

In the model, 'j' denotes the individual observation, 'v' indexes a group T (treatment) or C (control) and 't' denotes the time period which equals 1 or 2. 'Y' represents output variables. 'Time' is a dummy variable that equals zero for time 1 and one for time 2. 'Treatment' is a dummy variable that takes value one if the group is a treatment group and zero if the group is a control group. Impact is measured by analysing γ_1.

Review of Literature relating to the Methodology used in the Third Evaluation

The following illustrates two randomised designs of a nature similar to that used in chapter 5. Ashraf, Berry and Shapiro (2007) undertake a randomised experiment to determine if intervention of an information program assists Kenyan farmers adopt and market export crops. From 36 pre-existing self help groups (each of which contained an average of 28.7 farmers), 24 were randomly assigned to two treatment groups and the remaining 12 to a control group. Baseline and second round survey data was gathered for farmers within each of these groups. Impact of intervention across a range of dependent variables was measured by running a fixed effects OLS regression similar to equation 2.7.

A study by Banerjee, Cole, Duflo and Linden (2006) also resembles the methodological design applicable to the chapter 5 study. A section of Banerjee *et al.* (2006) investigate whether intervention of a remedial education program improves numeracy and literacy skills of low-achieving Indian students. Initially 5,945 grade 4 students in 111 schools were provided with a pre-test to estimate their academic competency. 58 schools were then randomly assigned a computer assisted learning program while the remaining 57 were not (and were consequently considered the control group). A second round survey was administered one year post-initial intervention to again estimate academic competency.

Impact of intervention on normalized test scores is measured over the intervention period using the fixed effects regression illustrated in equation 2.7.

Note, as opposed to Ashraf *et al.* (2007), the study in chapter 5 only considers one treatment group. Hence it is more similar to the design of Banerjee *et al.* (2006) than to Ashraf *et al.* (2007).

2.3 Comparison of Methodological Designs

The first evaluation, which asks the question, "Does access to formal savings facilities by rural Pacific Island villagers impact on their welfare?", is a classic example of a situation where evaluation of a program intervention is not undertaken until program completion and thus, analysis involves comparing older participants to newer participants. To improve methodological rigour, the analysis must argue why non-random program placement into older groups prior to newer groups, is not correlated with dependent variables. Further, the analysis must also demonstrate that *at the time of initial program implementation* the average newer participant, who self-selects into the program approximately a year after initial intervention, is statistically similar to the average older participant who self-selects into the program initially. This would address issues relating to selection bias. The first evaluation considers these concerns while illustrating potential bias from the ensuing results.

Nevertheless, even if non-random program placement and selection bias are addressed, failure to include other omitted variables, relating to unobservable characteristics and other observable characteristics that may be correlated with the dependent variable, may still create bias. As explained in section 2.2.1, this is an inherent limitation in cross-sectional designs of this nature (Niño-Zarazúa 2007; Meier and Sprenger 2008b).

The second study which asks the question, "Do time preferences impact on an individual's decision to maintain an open savings account?" is an example of an evaluation investigating characteristics of individuals who actual demand programs by comparing

'clients' to 'non-clients' in the same villages. The study is quasi-experimental as people offered savings facilities were not randomly selected.

The second study suffers from some similar limitations to the first study. In particular, the study fails to control for all omitted variables, such as time variant observable characteristics and unobservable characteristics, which may be correlated with the dependent variable (i.e. take-up of formal savings facilities).

However, unlike the first evaluation, it does not suffer from non-random program placement as all clients and non-clients were offered savings facilities at the *same* time. Recall, in the first evaluation people in older groups were offered savings facilities *before* people in newer groups. Further, it does not suffer from selection bias as clients and non-clients self-select at the same time. Also recall in the first evaluation, clients in older groups self-selected *before* clients in newer groups self-selected. Hence, when considering non-random program placement and selection bias, the second evaluation is more rigorous than the first evaluation.

The third study, which asks the question, "Does home delivery of state-run newspapers influence the political opinions of individuals to conform to the views of the state?", is an example of a study designed *prior* to the administering of an intervention. It follows a rigorous experimental design where some villages, from a larger sample of villages, were randomly selected to receive newspapers (treatment villages) while other were randomly selected not to receive newspapers (control villages). Hence the design does not suffer from non-random program placement. Further, as households within both treatment and control villages were also randomly selected, the study does not suffer from selection bias. Thus, when considering issues involving non-random program placement and selection bias, evaluating program impact using an experimental design is more rigorous than administering a quasi-experimental design similar to that used in the first evaluation.

Additionally, the randomisation process assumes that on average, characteristics of treatment group members are identical to control group members. This is supported by data gathered from the baseline survey. Hence, on average, the only difference between the two groups after an intervention period would be attributed to the intervention. Thus unlike

the first and second evaluations, the third evaluation does not suffer from omitted variable bias.

Clearly the final experimental evaluation is more rigorous than the quasi-experimental designs. If organisations can design experimental evaluations prior to program implementation, they would have a stronger estimation of impact. Note, other potential limitations of the three designs are considered separately within subsequent chapters.

Chapter 3 – Welfare Impacts from Access to Formal Micro-Savings Facilities

3.0 Introduction

Cornford (2001) and Conroy (2006) suggest that increasing household savings in Pacific Island countries, in particular formal savings, is welfare enhancing. However there is little empirical evidence to support such claims. For policy makers to seriously consider whether they should financially support micro-savings organisations in the Pacific, a critical question needs to be empirically addressed; does access to formal savings facilities by rural communities in a Pacific Island country impact on their welfare? The question takes on added urgency when considering the largest bi-lateral aid donor in the Pacific region, AusAID, has increased its support for microfinance in 2009.

This chapter investigates the question: "Does access to formal savings facilities by rural Pacific Island villagers impact on their welfare?" Access to savings facilities may encourage people to commit more money into savings (Aportela 1999) and/or reallocate savings from informal savings facilities to formal saving facilities (Vonderlack and Schreiner 2002). The improvement in welfare due to access to formal savings was previously defined (refer to chapter 2) as increased levels of savings, the increased discipline savers have over their own savings and expenditure patterns, the use of formal savings facilities as anonymous vehicles for savings and reduced difficulty in paying for household expenses.

In this study, welfare impact is considered in two stages; firstly whether people who access formal savings facilities use them as payment tools, thus improving welfare by reducing the difficulty involved in paying for particular items[20]. Secondly, whether formal savings facilities are used as commitment devices, which improves welfare by increasing savings levels, or as tools to reallocate money from informal to formal savings facilities, which improves welfare by increasing deposit discipline and reducing the 'temptation' to withdraw money.

[20] These 'items' relate to educational items, items relating to particular events (such as Easter, Christmas, birthdays, etc.), clothes, kitchen utensils and tools used to harvest and sell produce. Refer section 3.3 for further details.

It is hypothesised that welfare will be enhanced when formal savings facilities are used as payment tools and commitment devices, making it 'less difficult' for people living in households with high levels of formal savings to pay for higher value items that fall due periodically, such as seasonal gifts and school fees (i.e. lumpier items).

The ANZ rural banking program in the Solomon Islands presented a unique opportunity to answer the research question. Importantly, ANZ began offering a formal savings facility, designed as a commitment device, to rural clients in December 2005 and did not offer credit facilities until *after* this study was completed. Hence impacts of offering a formal savings facility can be considered without having to tease out the influence of credit.

A cross-sectional quasi-experimental design is used to estimate whether 'access to the ANZ rural savings account' by ANZ client households, impacted on their 'perceptions of difficulty involved in paying for particular items'. The dependent variable used in this study is 'not experiencing difficulty involved in paying for particular items'. To measure impact, output variables[21] gathered from 231 'control village' clients, whose villages were just offered intervention[22], are compared to output variables gathered from 268 'treatment village' clients, whose villages were offered intervention a year prior to control village clients. Issues relating to non-random program placement and selection bias are considered while equality between treatment village client households and control village client households is estimated by comparing time-invariant observable characteristics between the two groups. Additionally, treatment village clients are asked if, as a result of access to the ANZ savings facilities, the household saves 'more', implying savings facilities are used as a commitment device, or experiences 'no change', suggesting formal savings facilities are used as a reallocation tool.

This study is the first to consider empirically the welfare impact of access to formal savings facilities in a Pacific Island country. It is also the first to consider welfare impacts from the

[21] Output variables are subjectively measured as 'perceived levels of difficulty involved in paying for selected items' by household members and are described in detail in section 3.3. This 'subjective' approach is not new in academic literature. For instance Karlan and Zinman (2008) estimate welfare using perceptions of health, stress, depression and optimism across different numerical scales.

[22] In chapter 3, 'access to the ANZ rural savings account' is used interchangeably with the 'intervention'.

use of formal savings facilities as payment tools and reallocation tools. Results show intervention reduces the difficulty associated with paying for higher value less frequent purchases. Results also demonstrate intervention does not significantly influence the difficulty associated with paying for low value more frequent items. Hence formal savings facilities appear to be used as a payment tool to reduce the difficulty relating to payments on 'lumpier' items.

Further, after accessing formal savings accounts for approximately a year, 28 percent of households with treatment village clients use formal savings accounts as commitment devices. Conversely 68 percent of households with treatment village clients use formal savings facilities to reallocate funds. Interestingly, the 28 percent of households that committed to saving more, experience less difficulty when paying for particular items relative to the 68 percent of households that reallocated their cash. Thus welfare impacts from using formal savings facilities as a payment tool is greater for those people in households that use savings as commitment devices.

The rest of this chapter is outlined as follows; section 3.1 provides background information on the Solomon Islands, the community being investigated and the ANZ rural banking program. Section 3.2 explains the evaluation design and section 3.3 explains the model. Section 3.4 illustrates the summary statistics and section 3.5 presents the results. Section 3.6 highlights some limitations to the study and section 3.7 concludes.

3.1 Background

The following provides background information on the Solomon Islands[23], the community being researched and ANZ's rural banking program.

3.1.1 The Solomon Islands

The Solomon Islands is an archipelago of islands located in the Southwest Pacific approximately 1900 kilometres northeast of Australia. These islands stretch approximately 1450 kilometres and constitute both mountainous and low lying terrain. The climate is

[23] Background information sourced from the United States Department of State 2008 website, viewed 19-12-08, <http://www.state.gov/r/pa/ei/bgn/2799.htm>.

tropical monsoon. The capital of the country is Honiara, situated on the island of Guadalcanal.

The population of the Solomon Islands in 2006 was approximately 552,438 people. The majority of these people are Melanesian (93 percent), while the other main ethnic groups are Polynesian (4 percent) and Micronesian (1.5 percent). The official language is English, however Solomon Islands Pidgin and approximately 118 other languages are also spoken. Almost 80 percent of children attend primary school and life expectancy is 62.3 years. Approximately 95 percent of the people follow a denomination of Christianity.

The government is a 50 member parliamentary democracy with the prime minister as the head of the government and a governor general acting as the representative of the British Monarch.

The GDP in 2007 was 270 million Solomon Dollars with an annual growth rate of 10 percent. The average weekly household expenditure is 449 Solomon Dollars (Darcy, Gagahe and Lahari 2006), reflecting an economy largely built on subsistence crops of yams, taro, bananas and pineapples. Trade largely comprises of exporting agricultural products such as copra, cocoa and palm oil as well as fish and timber and importing fuels, food, machinery and transport equipment. The major trading partners are Australia, China, South Korea, Thailand and Singapore.

3.1.2 The Community

The community researched consists of 19 similar villages located between 37 and 43 kilometres east of Honiara, Guadalcanal. There is only one main road in Guadalcanal and roads leading into rural villages, which are made from sand, largely diverge from this road. The villages have houses with roofs and walls largely made from timber or sago palms. Water is sourced from rivers and wells and kerosene lamps are the major form of lighting. Vehicle ownership is very rare and people travel predominately on foot or take a van (which acts as a bus) from the main road.

Men engage in agricultural farming and fishing within the area, using the produce for both consumption and sale in the Honiara market. Transport of produce to the market is undertaken in a communal van or truck. Women generally remain at home and look after the house, elderly family members and children. Some assist with the farming while others work at small food outlets scattered sparsely throughout the community.

Shopping for daily food that is not harvested is undertaken at small local stores within the community while larger consumables are purchased from Honiara. The consumption of rice, taro, coconut, kasava, bananas and fish is very common while meat, and to a lesser extent consumption of dairy products, is rare.

Clothes are shared between people in the village and purchased second hand from Honiara. Any amenities, such as musical instruments or soccer balls are first purchased from Honiara and then also shared within the community. The people within the communities are religious and attend church on a weekly basis.

In the Solomon Islands there is an informal collective system of responsibility known as the 'won-tok' system. This loosely translates into 'one-talk', where people assist other people within the same family group, trading area and political persuasion (Meltzoff and LiPuma 1983). Results from the pilot survey and field interviews with both ANZ clients and ANZ staff indicated that the won-tok system is strong within the community and is strongest within the immediate family unit, where household expenditure and savings are largely designed to benefit the group as opposed to the individual.

3.1.3 ANZ Rural Banking Program (background of the intervention)

The following provides a brief description of the ANZ savings program considered in this study. ANZ bank is Australia's third largest bank and has over 30,000 employees. It operates in 27 countries and is the largest bank operating throughout the Pacific Island countries.

Rural Banking differs from microfinance as it focuses primarily on providing savings and loans for general consumption purposes. Conversely the majority of microfinance

institutions have focused on issuing credit for entrepreneurial purposes. At the time of the survey, there were no other organisations providing rural banking or microfinance services to rural communities.

In December 2005 ANZ expanded its rural banking program into the Solomon Islands. This initially involved provision of formal savings facilities however in mid-April 2007 eligible clients were permitted to apply for credit facilities. The bank requires people demonstrate a pattern of continuous deposits during a minimum period of 6 months before credit will be issued.

This study focuses on the intervention of ANZ's rural banking savings scheme. At the time of the survey, approximately 2500 people held rural banking savings accounts that earn interest at 0.5 percent per annum. The total value of deposits was uncertain as ANZ bank was unwilling to divulge this information.

The savings account is designed as a commitment device. It encourages people to actively save by charging no minimum opening balance or monthly fee while discouraging them to withdraw by imposing a withdrawal cost of 6 Solomon Dollars (which represents approximately 1.34 percent of the average weekly rural household expenditure[24]). Funds can only be accessed through the rural banking truck or at the ANZ branch in Honiara. Critically, the rural bank only comes into the village once every two weeks, and as villages are located in remote areas, rural clients are unlikely to have the time or resources to transport themselves to the ANZ branch in Honiara. This reduces the probability that a person will withdraw cash every time they have an immediate desire, further encouraging clients to use the scheme as a commitment device. Nevertheless, clients are free to withdraw funds as they wish.

The rural banking scheme operates by using a mobile bank which travels into the village. This 'mobile' bank is an ANZ truck carrying deposit slips, loan request forms[25] and daily

[24] Per the official Solomon Island Household Income and Expenditure Survey (2005/6), the average weekly rural household expenditure was 449 Solomon Dollars (Darcy *et al.* 2006). Average weekly household expenditure was used in this calculation as the data is considered more reliable than average weekly income (Abbott 2008).

[25] Loan request forms were only provided to clients in the Solomon Islands after April 2007.

cash takings. It reaches villages fortnightly and operates as a bank with bank tellers sitting inside the truck and serving clients waiting outside the truck. After transactions are completed, the truck moves onto the next village. The number of villages a truck visits in a day depends on the distance of villages from the truck's base of operations. At day's end, tellers manually enter the day's transactions into the ANZ computer system.

Given village life generally revolves around subsistence agriculture, many clients are farmers who are likely to be located near the family home. Hence ANZ's rural banking program is convenient as clients can deposit funds or receive loans when the truck arrives at the village.

3.2 Evaluation Design

This evaluation follows a post-test only cross-sectional quasi-experimental approach. The data used in the study was gathered through an independent survey (from mid-April 2007 to mid-May 2007) of 268 participants in 11 villages who were offered and opened savings accounts between January 2006 and mid-March 2006 (time 1) and 213 participants in 8 villages who were offered and opened savings accounts between March 2007 and mid-April 2007 (time 2). Refer figures 3.1 and 3.2 for details of village location.

The 213 participants in the 8 villages are considered control village clients living in control villages as they accepted intervention (access to formal savings facilities) just prior to the survey. Intervention will not have had an immediate impact (across the dependent variables measured[26]) on these control village clients. The 268 participants in 11 villages are considered treatment village clients who live in treatment villages as they accepted intervention approximately a year prior to control village clients.

[26] The dependent variable is "not experiencing difficulty involved in paying for particular items" during the 12 months prior to the survey. Refer Section 3.3 for more details on dependent variables.

Figure 3.1: Map of Guadalcanal, Solomon Islands

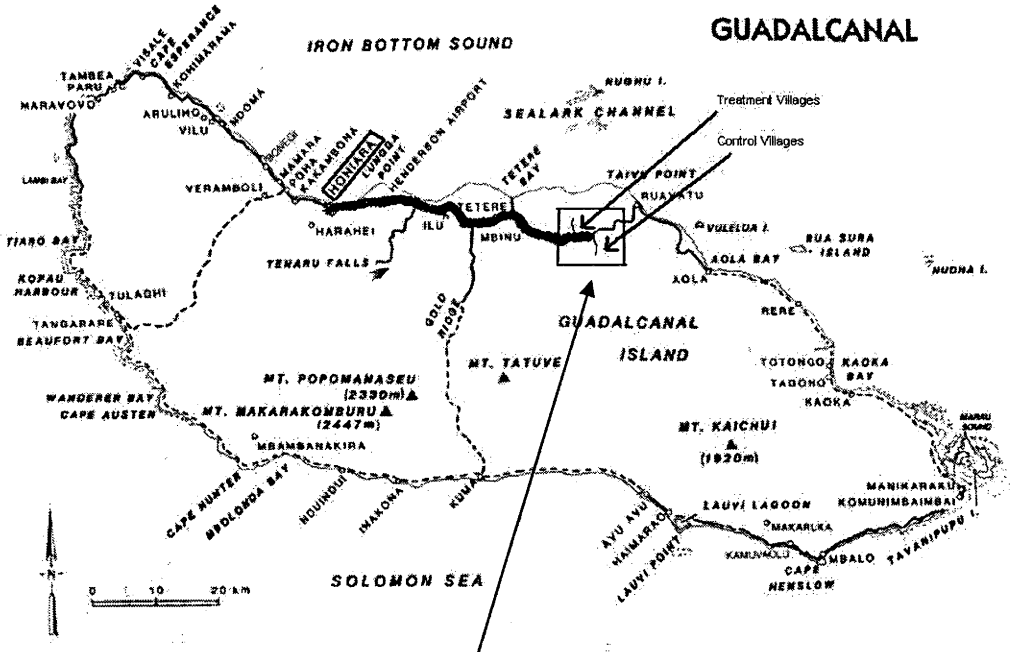
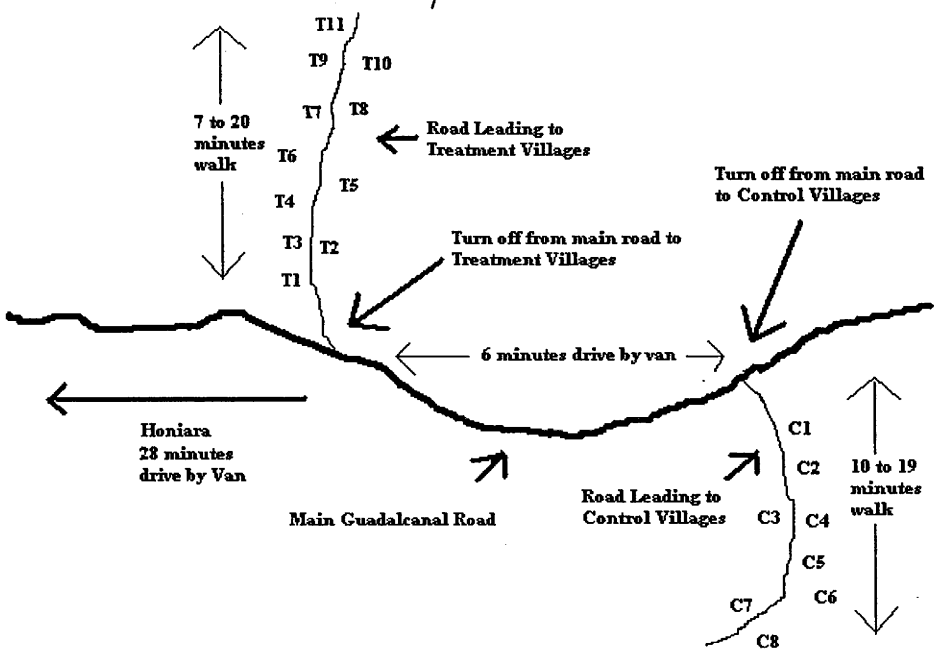


Figure 3.2: Surveyed Villages in Guadalcanal[27]



[27] Figure 3.2 provides a map of the approximate locality of treatment and control villages relative to each other. T1 to T11 denotes treatment villages 1 to 11 respectively. C1 to C8 denotes control villages 1 to 8 respectively. The distance between the turn off to treatment villages and control villages is 6km.

Analysis is undertaken by comparing household data gathered from clients in treatment villages to household data gathered from clients in control villages. Ideally, information relating to non-client households in treatment and control villages would also have been gathered enabling comparison of all households between treatment and control villages (thus allowing consideration of spillover effects and reducing issues related to selection bias). However, due to budgetary constraints, non-client data was not gathered for people in control villages. This approach of not considering characteristics of non-clients is similar to the approach taken in other studies that compare treatment group clients to control group clients (see for example Niño-Zarazúa 2007).

Villages are located in the same region of Guadalcanal. During the survey process, it was confirmed that all interviewees lived at the same place since March 2006. Furthermore, as interviewers selected survey respondents directly from their own homes, treatment village clients do not include people who move from other villages to treatment villages to access formal savings facilities.

As data is collected in one time period, this cross-sectional design may suffer from bias due to non-random program placement. Hence, to validate the study's design, it must be illustrated to a reasonable degree that treatment and control villages were statistically similar pre-intervention and selection of treatment villages by ANZ at time 1 were not due to any observable or unobservable characteristics that are correlated with the dependent variable. Thus, section 3.2.1 considers the potential bias from the non-random placement of micro-savings into villages.

Cross-sectional studies may also suffer from bias due to selection bias[28]. Hence, it must also be illustrated that clients within control villages who accepted savings facilities at time 2 would also have accepted savings facilities at time 1 and that non-clients in control villages who did not accept savings facilities at time 2 would not have accepted savings facilities at time 1. Thus section 3.2.2 suggests reasons as to why clients and non-clients in control villages at time 2 are likely to have remained clients and non-clients at time 1 respectively.

[28] i.e. bias due to the process involved in selecting clients.

The dependent variable used in this study is 'not experiencing difficulty involved in paying for particular items' during the 12 months prior to the survey.

3.2.1 Considering Potential Bias from Village Selection

The 19 treatment and control villages were selected for analysis in this study as they were most likely to form a natural quasi-experiment. For example, the approximately one year time frame between when people in treatment and control villages were offered formal savings facilities is sufficiently long to estimate impacts from access to formal savings facilities. Additionally, none of the villages were offered formal savings by another institution, hence reducing possible substitution bias.

Given the cross-sectional nature of the study, where the survey was undertaken at time 2, there was no possibility to gather information at time 1. Nevertheless, it is important to illustrate that pre-intervention (time 1), village level characteristics are statistically similar between the average control and treatment village. Hence, there was a concerted attempt to gather time 1 observable data from external sources to no avail[29]. In the absence of other data, another option is to use time-invariant observable characteristics to show that this similarity exists at both time 1 and time 2. Table 3.1 uses balancing tests to demonstrate that time-invariant observable characteristics collected from survey respondents are statistically similar between the average control and treatment village[30]. Indeed, there was only 1 variable from a total of 19 that was statistically different (at the 10 percent level) when undertaking analysis using t-tests. Variables analysed include household demographic composition (such as age and number of people, children and workers), educational levels and proxies for wealth (such as quality of household walls, roofs and bedrooms)[31].

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[29] Refer Appendix 3A for investigation undertaken to source relevant information.

[30] Note that table 3.2 considers the similarity between the average treatment and control village client at the individual level while a review of table 3.2a illustrates the similarity in the distribution of answers provided by treatment and control village clients. These tables are considered in section 3.2.2.

[31] Note some of these characteristics might be time-variant. Refer limitations section 3.6. Also note that while table 3.1 highlights the change in income is statistically the same between the average treatment group member and average control group member, there is a strong positive correlation between those people who stated they saved more (illustrated in section 3.5.2) and those people who experienced a greater change in their income (R^2 of 0.7961).

Table 3.1: Balance Test
Village Level Demographic Characteristics
Sample Frame: Treatment Villages (11), Control Villages (8)
T-test, ANOVA (F-test)

	Treatment Villages		Control Villages		Balance Test***				Comment****	Data used*****
	Mean	S.E.	Mean	S.E.	T-Test	P-Value	ANOVA	P-Value		
Demographic Characteristics										
People over 55	0.53	0.16	0.61	0.22	1.00	0.33	1.43	0.11	People over 55 years of age = 0,1,>1	0,1,2
Was the interviewee the household head?	0.49	0.12	0.52	0.12	0.40	0.70	1.24	0.23	yes, no	1, 0
Age of household head	44.18	1.63	44.84	2.20	0.75	0.46	0.98	0.48		
Education of household head	1.04	0.10	1.04	0.17	0.01	0.99	0.59	0.91	Primary, secondary, tertiary^	1,2,3
Number of people living in household	6.06	0.10	6.01	0.12	0.32	0.75	0.78	0.72		
Number of working adults in household^^	2.54	0.21	2.68	0.29	1.19	0.25	1.28	0.19		
Number of children	2.85	0.22	2.73	0.26	1.10	0.29	0.72	0.79		
Number of children going to school	2.48	0.20	2.35	0.22	1.34	0.20	0.61	0.90		
Dependency Ratio	0.43	0.03	0.45	0.03	1.40	0.18	1.01	0.45	No. of working adults/no.of people in household	
Children/Workers	1.36	0.15	1.21	0.21	**1.76***	0.10	0.93	0.54		
Number of people who don't work or don't go to school	1.03	0.16	0.98	0.21	0.59	0.56	1.01	0.44		
Age of interviewee	36.92	2.06	36.97	3.64	0.04	0.97	1.24	0.22		
Sex of interviewee	0.55	0.11	0.58	0.13	0.59	0.57	1.37	0.14	Male, female	1, 0
Education of interviewee	1.32	0.13	1.32	0.14	0.04	0.97	0.78	0.73	Primary, secondary, tertiary^	1,2,3
Household quality										
Roof	0.47	0.12	0.57	0.14	1.61	0.13	**1.55***	0.07	Sago Palms, Timber	0,1
Walls	0.44	0.10	0.50	0.10	1.46	0.16	1.04	0.42	Sago Palms or Timber, Copper^^^^	0,1
Number of bedrooms	1.13	0.10	1.16	0.04	0.82	0.43	1.08	0.37	1, 2, 3 bedrooms or >3 bedrooms	1,2
Income change^^^ (self reported)	1.15	0.12	1.22	0.14	1.06	0.30	1.17	0.28	Decrease, no change, increase	0,1,2
Distance to Village from main road (kilometres)	1.17	0.41	1.11	0.27	0.36	0.72	N/A	N/A	Increases from smallest distance to greatest distance	

* Significance at the 10 percent level
** Significance at the 5 percent level
^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively.
^^ Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.
^^^ Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income is denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.
^^^^ Households that had roofs made from Sago Palms or Timber are combined in the data set.
*** The t-test estimates the null hypothesis that the average treatment group village is statistically similar to the average control group village across a particular variable. The ANOVA F-test estimates the null hypothesis that all villages are statistically similar to each other across a particular variable.
**** Comment refers to a comment made on the corresponding independent variable in the table.
***** "Data used" corresponds to the information in the comments section.

Clearly, using only time-invariant observable characteristics to estimate similarity between control and treatment villages is not ideal. Specifically, the inability to test similarity of all observable characteristics and unobservable characteristics between control and treatment groups pre-intervention is an inherent limitation experienced by other cross-sectional studies (MkNelly and Lippold 1998; Niño-Zarazúa 2007).

The close proximity of these villages increases the possibility that village level characteristics were on average, similar across treatment and control villages pre-intervention. For example, villages contain consumable items purchased from the same market, consist of people employed in the same industries and two large schools are located within both treatment and control villages. This approach of using "geographical criterion" to suggest homogeneity of groups is used in other cross-sectional studies (see for example Niño-Zarazúa 2007). Additionally, some observable village level characteristics (such as distance to markets, access to services and the number of houses) are unlikely to change over the short-term.

The analysis of time-invariant characteristics and the close proximity of the villages suggest similarity exists between the average treatment and control village pre-intervention. Nevertheless, there is no time 1 data available to corroborate this claim. Hence, if treatment villages have characteristics that make it more (less) difficult for people to pay for particular items relative to control villages, then results will be downwardly (upwardly) biased.

If ANZ are taken at their word, there is no unobservable reason why certain villages were selected for intervention before others. Indeed, ANZ stated that the *only* observable reason why treatment villages were offered formal savings facilities before control villages was because the road leading into treatment villages was upgraded prior to initial intervention, enabling the road to then support the ANZ truck. The road leading into control villages was upgraded approximately seven months after initial intervention. The road leading to treatment villages was upgraded first due to its closer proximity to Honiara (37km) relative to the control villages (43km). Note that there is only one main road in Honiara and most roads in rural areas diverge from this road (refer figures 3.1 and 3.2).

Unobservable reasons (such as people in treatment villages having better political connections to local government) for the road upgrade to treatment villages before control villages appears improbable as the only reason certain roads were upgraded by the government prior to others was due to their closer proximity to Honiara. Moreover, roads leading into villages closer to Honiara were upgraded prior to roads leading into treatment villages and roads leading into villages further away from Honiara were upgraded after roads leading into control villages.

Bias could occur if the road upgrade raised incomes or savings and hence influenced dependent variables (i.e. through resulting in lower perceived difficulty in paying for particular items in treatment villages relative to control villages)[32]. To consider this, treatment and control village clients were asked "Did household income decrease, experience no change or increase between January 2006 and March 2007 relative to the period between January 2005 to January 2006?" Results in table 3.1 (see 'income change' variable) highlight answers were statistically similar between the average treatment village and average control village. Admittedly, it might be difficult for people to accurately recall income levels from a year prior to the survey[33]. However, given the lack of income data pre-intervention at time 1, this was the most practical approach to show that the road upgrade in treatment villages has not resulted in increased income among the average treatment village household relative to the average control village household.

The road leading into treatment villages is 37km from Honiara while the road leading into control villages is 43km from Honiara. The range of distances to treatment villages from the main road is 550 metres to 1700 metres while the range of distances to control villages from the main road is 800 metres to 1550 metres (refer figures 3.1 and 3.2).

[32] It is possible that better roads could influence non-income related activities such as improving the ability of people to keep in regular contact with friends who own shops and can provide discounts on gifts. This may in-turn reduce the difficulty involved in paying for particular gifts at Easter, Christmas or for Birthdays. If this is the case, then treatment group members may find it easier to pay for particular items relative to control group members and results will be upwardly biased.

[33] As the income change figures are based on retrospective analysis, these figures should be interpreted with caution. Indeed, literature shows that retrospective levels and changes in income may be different to actual changes in income (Nakata, Sawada and Tanaka 2009). A paper by Gibson and Kim (2009) also suggests that changes are more difficult to recall than levels of income. Hence, if the income change figures recorded in this study are inaccurate and the average treatment group member actually experienced a higher change in income than the average control group member during the intervention period, the impact of intervention would be upwardly biased.

When considering the impact that proximity to Honiara from villages may have on dependent variables, it is time rather than distance that matters. For instance, village elders explained trucks (similar to the ANZ truck) and normal sedans do not use roads leading into villages. Instead people in these villages travel predominately on foot between their village and the main road. Conversely, if a villager has to travel into town, they take a van which passes along the main road and is easily accessible to all clients. Clearly the time taken to walk is longer than the time taken to travel on a van[34].

The impact that proximity to Honiara from villages has on the dependent variables can be considered in two stages. Firstly, bias could occur if the travel time from treatment and control villages to the main road influences the difficulty involved in paying for particular items[35]. An average person walks at approximately 5 km per hour. Hence the travel time to the closest and the farthest treatment village from the main road is approximately 7 minutes and 20 minutes respectively[36]. The travel time to the closest and the farthest control village from the main road is approximately 10 minutes and 19 minutes respectively[37]. The distance (and hence time) between the average treatment village and the main road is statistically similar to the distance between the average control village and the main road (refer table 3.1). Further, when considering control and treatment villages separately, regression analysis undertaken in Appendix 3B illustrates distance (and hence time) to the main road from the village does not significantly influence the large majority of dependent variables[38].

Bias could also occur if the time taken to travel the 6 kilometres between the turn offs to treatment villages and control villages on the main road influences the difficulty involved in paying for particular items[39] (refer figure 3.2). Assuming a van travels at an average

[34] The van costs the same regardless of whether a person is picked up at the cut off point leading into treatment villages or into control villages.
[35] Refer figure 3.2.
[36] Calculated as 550 metres/(5000metres/60 minutes) for the closest control village and calculated as 1700 metres/(5000metres /60) for the farthest treatment village.
[37] Calculated as 800 metres /(5000 metres/60 minutes) for the closest treatment village and calculated as 1550 metres/(5000 metres/60 minutes) for the farthest control village.
[38] Distance only influenced the difficulty involved in paying for 4 out of the 25 items.
[39] Recall, the treatment villages are located 37km from Honiara and control villages are located 43km from Honiara.

speed of 80km/h on the main Honiara Road, the travel time between the turn offs to treatment and control villages is approximately 6 minutes[40]. If the distance (and hence time) from the treatment villages and control villages to the main road does not influence the majority of dependent variables (as illustrated in appendix 3B) between a margin of 7 minutes to 20 minutes and a margin of 10 minutes to 19 minutes respectively, then it is reasonable to assume the additional 6 minutes it takes to travel between the turn offs to the treatment and control villages on the Honiara road would also not influence the dependent variable. Further, it would be easier to travel on a van (for the 6 minutes) between the turn off points than travel by foot between the main road and the village. Hence the difference in distance between the control and treatment villages from Honiara is unlikely to influence the difficulty involved in paying for particular items.

Given the only reason why certain villages were chosen over others was due to a seven month gap in road development, that differences in the large majority of time-invariant observable characteristics between treatment village clients and control village clients at the village level are statistically insignificant and that villages are within very close proximity to each other and pay the same local prices, the likelihood of bias from non-random program placement is reduced. However, if the slightly higher quality of roads leading into treatment villages over control villages during the seven month period, the closer proximity of treatment villages to Honiara relative to control villages, or any other differences, reduces the difficulty associated with paying for selected items in household in treatment villages, results will be upwardly biased.

3.2.2 Considering Potential Bias from Selection of Individuals within Villages

During the survey, clients in control villages were asked if given the option, whether they, or any other household member, would have opened savings accounts a year ago. Only respondents who answered 'yes' were included in the survey, thus reducing the likelihood of selection bias. As opposed to accepting credit facilities, there is no cost in opening a rural banking savings account. Hence it is reasonable to assume someone who indicated they would have opened a savings account a year ago, would in-fact have opened a savings account a year ago. However if clients in control villages would not have opened savings

[40] Calculated as 80km/60minutes x 6 km, where the 6 km represents the difference in distance between the turn-off points on the main Honiara road to the control and treatment villages.

accounts a year ago, and they experience greater (lower) difficulty paying for particular items, then results may be downwardly (upwardly) biased.

There is the possibility people who did not open a savings account in control villages (non-clients) may have opened a savings account a year earlier. Again the likelihood of selection bias is reduced as there is no financial or time cost involved in opening a savings account (recall that the ANZ truck comes directly to the village). Nevertheless, if non-clients in control villages would have opened formal savings facilities if given the option a year ago, and they experience greater (lower) difficulty paying for particular items, then results will likely be upwardly (downwardly) biased.

To support the argument that selection bias is unlikely to be problematic, table 3.2 demonstrates time-invariant observable characteristics, including wealth proxies, are insignificantly different at a household level in treatment and control villages[41]. Further, a review of table 3.2a shows similarities in the distribution of the time-invariant observable characteristics between the average treatment and control village household. Hence, due to their time-invariant nature, these characteristics are also likely to be insignificantly different between the average treatment and control village household at time 1.

It is unlikely that more control village clients would open a savings account because they had greater time to hear about ANZ rural banking than treatment village clients. Recall people considered 'clients' in control and treatment villages were those that opened a savings account during the period approximately two and half months after initial intervention. Importantly, very few people in treatment villages (those in only 17 households[42]) became clients between two and half months to approximately a year after initial intervention. This period of time should be sufficient to convince any other potential clients to open savings accounts. Consequently, it is unlikely that many more people in control villages, relative to people in treatment villages, would become clients in the two and half months post initial intervention into their villages, because they had greater time to hear about ANZ rural banking.

[41] Arguably some of these characteristics may be time variant; refer limitations, section 3.7.
[42] These households are not included in the 268 treatment village clients.

Is it possible people in control village had more time to hear about the ANZ rural banking and hence would be *less* likely to open a savings account? Given ANZ's high demand for micro-savings products, illustrated in part through an expansion of similar services across other areas of Guadalcanal, this is also unlikely.

Table 3.2: Balance Test
Household Level Demographic Characteristics
Sample Frame: Treatment Households (268), Control Households (213)
T-test

	Treatment Villages		Control Villages		Balance Test		Comment***	Data used****
	Mean	S.E.	Mean	S.E.	T-Test	P-Value		
Demographic Characteristics								
People over 55	0.549	0.704	0.573	0.659	0.386	0.700	People over 55 years of age = 0,1,>1	0,1,2
Was the interviewee the household head?	0.496	0.501	0.493	0.501	0.072	0.943	yes, no	1, 0
Age of household head	44.228	8.731	44.822	8.790	0.739	0.460		
Education of household head	1.041	0.741	1.052	0.695	0.160	0.873	Primary, secondary, tertiary^	1,2,3
Number of people living in household	6.041	1.563	5.925	1.588	0.804	0.422		
Number of working adults in household^^	2.556	0.995	2.624	1.005	0.746	0.456		
Number of children	2.817	1.377	2.723	1.378	0.745	0.457		
Number of children going to school	2.448	1.246	2.343	1.251	0.917	0.360		
Dependency Ratio	0.438	0.167	0.449	0.159	0.702	0.483	No. of working adults/no.of people in household	
Children/Workers	1.328	0.985	1.239	0.911	1.015	0.311		
Number of people who don't work or don't go to school	1.030	0.843	0.958	0.791	0.957	0.339		
Age of interviewee	36.940	11.030	36.859	11.317	0.079	0.937		
Sex of interviewee	0.556	0.498	0.568	0.497	0.265	0.791	Male, female	1, 0
Education of interviewee	1.332	0.753	1.324	0.689	0.122	0.903	Primary, secondary, tertiary^	1,2,3
Household quality								
Roof	0.493	0.501	0.540	0.500	1.031	0.303	Sago Palms, Timber	0,1
Walls	0.433	0.496	0.484	0.501	1.109	0.268	Sago Palms or Timber, Copper^^^^	0,1
Number of bedrooms	1.112	0.316	1.160	0.367	1.530	0.127	1, 2, 3 bedrooms or >3 bedrooms	1,2
Income change^^^ (self reported)	1.168	0.566	1.169	0.590	0.021	0.983	Decrease, no change, increase	0,1,2
Distance to village from main road (kilometres)	1.089	0.401	1.100	0.230	0.384	0.701	Increases from smallest distance to greatest distance	

* Significance at the 10 percent level.
** Significance at the 5 percent level.
^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively.
^^ Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.
^^^ Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income is denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.
^^^^ Households that had roofs made from Sago Palms or Timber are combined in the data set.
*** Comment refers to a comment made on the corresponding independent variable in the table.
**** "Data used" corresponds to the information in the comments section.

Table 3.2a: Summary Statistics
Detailed Household Level Demographic Characteristics
Sample Frame: Treatment Households (268), Control Households (213)

	Treatment Households						Control Households					
Number of people over 55 (percentage)	**0** 55.22%	**1** 36.94%	**>1** 7.84%				**0** 49.77%	**1** 45.54%	**>1** 4.69%			
Was the interviewee the household head? (percentage)	**Yes** 49.63%	**No** 50.37%					**Yes** 49.30%	**No** 50.70%				
Age of household head (years)	44						45					
What education has the household head received?^ (percentage)	**None** 22.39%	**Primary** 77.61%	**Secondary** 23.51%	**Tertiary** 2.99%			**None** 19.25%	**Primary** 80.75%	**Secondary** 22.07%	**Tertiary** 2.35%		
Number of people living in household (percentage)	**<4** 4.85%	**4** 10.45%	**5** 20.15%	**6** 24.63%	**7** 23.51%	**>7** 16.42%	**<4** 5.16%	**4** 15.02%	**5** 21.60%	**6** 23.94%	**7** 15.49%	**>7** 18.78%
Number of working adults in household (percentage)	**1** 9.33%	**2** 45.90%	**3** 30.22%	**>3** 14.55%			**1** 13.15%	**2** 32.86%	**3** 35.68%	**>3** 18.31%		
Number of children (percentage)	**0** 5.60%	**1** 7.84%	**2** 29.10%	**3** 29.10%	**4** 17.16%	**≥5** 11.19%	**0** 7.04%	**1** 8.92%	**2** 26.76%	**3** 31.92%	**4** 16.43%	**≥5** 8.92%
Number of children going to school (percentage)	**0** 5.60%	**1** 14.18%	**2** 36.19%	**3** 24.25%	**≥4** 19.78%		**0** 8.45%	**1** 13.62%	**2** 34.27%	**3** 27.70%	**≥4** 15.96%	
Age of survey respondent	36.94						36.86					
Sex of survey respondent	**Male** 55.60%	**Female** 44.40%					**Male** 56.81%	**Female** 43.19%				
What education has the survey respondent received?^	**None** 13.43%	**Primary** 86.57%	**Secondary** 42.91%	**Tertiary** 3.73%			**None** 9.39%	**Primary** 90.61%	**Secondary** 38.50%	**Tertiary** 3.29%		
Has household income decreased (o), experienced no change (1) or increased (2) in the 12 months prior to the evaluation relative to the period between 24 months and 12 months	**0** 8.96%	**1** 65.30%	**2** 25.75%				**0** 10.33%	**1** 62.44%	**2** 27.23%			

^ Education refers to enrolment in a particular level of schooling.

Further, the 'sales pitch' ANZ uses to attract clients is similar across all target villages. Initially the village elders are informed about the program. Subsequently, the ANZ rural banking team leader (who was the team leader since initial intervention) outlines the benefits of saving with ANZ bank. Villagers are then given the option to open savings accounts. Consequently, people in control villages are unlikely to have received a more refined marketing strategy than people in treatment villages.

Importantly, ANZ confirmed none of the treatment village clients closed a bank account during the one year intervention period. Hence there were no program dropouts amongst the treatment village client households. As such, it is reasonable to assume if control village clients were offered savings accounts pre-intervention, they would also not close their bank accounts. Thus bias from program dropouts is unlikely to be problematic.

3.2.3 Summary

As in any cross-sectional study, it is difficult to eliminate bias related to non-random program placement and selection bias. In particular, given the lack of time 1 data, it is difficult to prove that all observable village level characteristics were similar pre-intervention between the average treatment village and control village and non-clients in control villages at time 2 would have been non-clients at time 1. This section has considered these issues and highlighted potential bias in the ensuing results.

3.3 Model

Given multiple household members may hold a savings account, enumerators followed a survey sequence where they interviewed the eldest male account holder. If male account holders were unavailable, a female savings account holder was interviewed[43]. There was a bias towards obtaining male responses over female responses as the Solomon Islands is a patriarchal society (Scales 2003) and hence males are considered to have the most household power. Other studies have also focused on particular genders if they are more likely engaged in the decision making process (Ashraf *et al.* 2007). The age and sex of survey respondents as well as the age of the household head were, on average, statistically

[43] All savings account holders were not interviewed due to financial constraints.

similar between answers provided by clients in treatment and control villages (refer table 3.1).

This study first investigates whether access to formal savings facilities reduces the perception of difficulty involved in paying for particular items. These 'items' were identified through analysis of literature and interviews with ANZ staff and clients and were considered areas where household members are most likely to spend savings. This study tests whether the 'perceived levels of difficulty' involved in paying for selected items varies between treatment and control village client households.

The set of selected 'k' items were categorised into four modules. These are highlighted in table 3.3.

Table 3.3 - Items Considered in the Survey (Categorised by Module)

Module	Selected 'k' Items
Education	School fees, school shoes, school books, school clothes, stationary, children's pocket money
Events	Easter, Christmas, birthdays, church activities
Other	Kitchen utensils, tools used to harvest and sell produce
Clothing	Clothes for friends, clothes for family members, Clothes for the survey respondent

During the survey, treatment village clients and control village clients were asked if their household[44] spent money on items in table 3.3. If they answer no, the observation was not included in any analysis[45]. If the answer was yes, they were asked how difficult it was for household members to pay for them. For example after asking the survey respondent "In the last 12 months, did the household spend money on school fees?", assuming the answer was yes, the next questions was "Have household members experienced difficulty paying for school fees?". Potential answers include 'yes', 'sometimes' and 'no'. To generate a greater sense of magnitudes, and because a very small percentage of people answered 'no' (refer figures 3.3 to 3.6[46]), answers to 'sometimes' and 'no' were combined to provide a

[44] Overall household expenditure was considered due to the 'won-tok' system in the Solomon Islands.
[45] Hence the number of observations varies depending on which 'item' is considered. Note, a person who did not purchase an item either does not want the item or cannot afford the item (i.e. has 100 percent difficulty). The results section considers this possibility.
[46] Refer section 3.4 for figures 3.3 to 3.6.

binary outcome[47]. Hence in the data set, a 'yes' answer equals 0, implying payments were more difficult, and a 'sometimes or no' answer equals 1, implying payments were less difficult.

An OLS model is used to analyse the majority of results. For comparative purposes, a binary probit model is also used. The binary probit model is a linear probability model that can be used to calculate the probability of a change in the dependent variable due to intervention.

To measure impact, the following equation is regressed:

$$D_{iv} = c + \gamma_1 x_{v1} + \gamma_2 x_{iv2} + u_{iv} \qquad \text{Eq 3.1}$$

D_{iv} represents the difficulty relating to the payment of item 'k', as perceived by survey respondent 'i' in village 'v' and equals 0 if payments are 'more difficult' and 1 if payments are 'less difficult'. Hence the dependent variable is 'did not have difficulty paying for item k' as perceptions of difficulty are ordered in *decreasing* difficulty. x_{v1} is a dummy variable representing the intervention and equals 1 for treatment villages and 0 for control villages.

x_{iv2} represents a vector of observable characteristics potentially impacting on the difficulty involved in paying for items as perceived by survey respondent 'i' in village 'v'. Some variables include those directly related to the interviewee (i.e. the interviewee's age, sex and level of education). These were primarily included to control for the possibility that a person's characteristics may influence how they answer questions. For example, a person with higher education may answer questions differently to a person with lower education. Similarly, a male or older person may answer questions differently to a female or younger person. *A-priori*, there is no evidence to conclude whether the signs of these variables will be positive or negative when regression equation 3.1.

[47] The ratio of the 0s, 1s and 2s across all answers is 7:53:41. When the 0s are collapsed into the 1s, the ratio is 60:41. If the 1s are collapsed into the 2s, the ratio would be 7:94. Clearly, the ratio of 60:41 more closely resembles the original ratio of 7:53:41 relative to the ratio of 7:94. Hence, to construct a binary variable, the 0s were collapsed into the 1s as opposed to the 1s being collapsed into the 2s

Proxies for wealth are also included as variables within x_{iv2}. It is expected these variables would be positive, implying wealthier households will find it less difficult to pay for particular items than poorer households. Changes in income experienced by the household in the 12 months prior to the survey relative to the period 24 months to 12 months prior to the survey were also included. Households that experience an overall increase in income are expected to have less difficulty paying for particular items relative to households that have not had an overall increase in income. Clearly, the influence of this variable is dependent on other factors such as the magnitude of the change and a household's level of income relative to the income of other households. Unfortunately, due to the cross-sectional nature of the study, such information could not be gathered.

Distance from the villages to the main road was included within x_{iv2} as people who have a shorter distance to walk may find carrying particular items easier than people who have a longer distance to walk.

Additionally, when considering specific modules, other variables are sometimes included within x_{iv2}. In relation to the education module, the number of children and the number of children attending school are included as variables. In regards to payments relating to Easter, Christmas and birthday expenditure, the number of children is included as a variable. It is expected that due to a higher financial burden, the greater the children, and greater the children attending school (in relation to the education module), the less difficult it is to pay for particular items[48].

Note, assuming there is no significant bias relating to non-random program placement and from selection bias, the possibility of significant differences between unobservable and observable household and village level characteristics of the average treatment and control village client are reduced. Nevertheless, as previously noted, the failure to include all other potential observable characteristics and unobservable characteristics that influence the dependent variable in equation 3.1 (i.e. omitted variable bias) is an inherent limitation experienced by cross-sectional studies (see for example MkNelly and Lippold 1998).

[48] Clearly this may not hold true in every case as wealthier households can more easily afford costs involving children than poorer households.

Finally, this study determines whether treatment village client households save more, experience 'no change' or save less due to access to a formal savings account, by asking the following question: "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?".

3.4 Summary Statistics

The following notes some key summary statistics relating to treatment and control village client households illustrated in tables 3.2 and 3.2a.

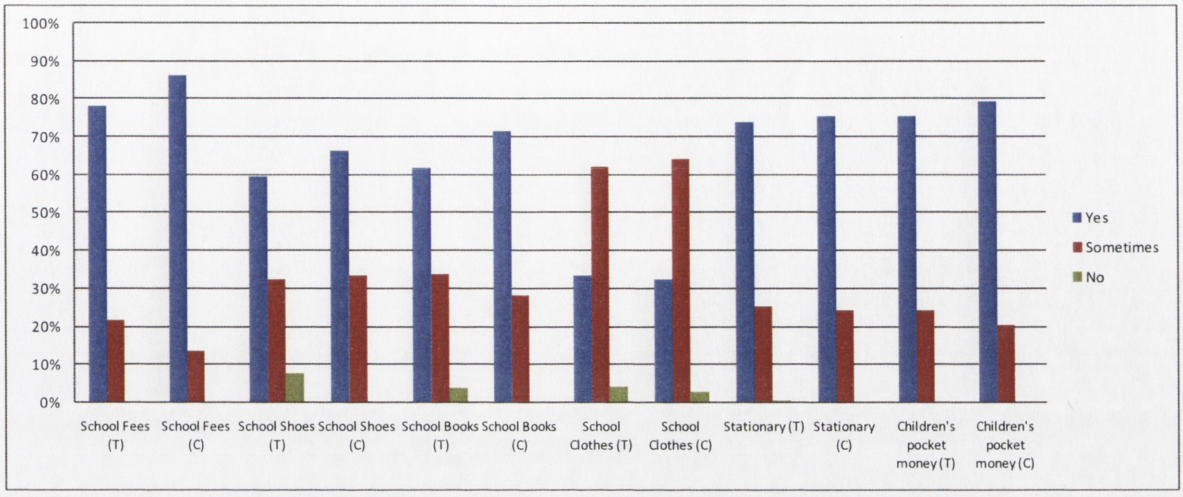
The average age of the survey respondent is 37 years and 56 percent of respondents are male. Approximately 80 percent of households have more than 4 people living in their homes and 88 percent of households have at least 2 or more working adults[49]. Over 92 percent of households have 1 or more children and over 90 percent of households have at least 1 child enrolled at school. The average distance from the main road to control villages that each person had to travel was 1089 metres while the average distance from the main road to treatment villages was 1100 metres. Refer tables 3.2 and 3.2a for other statistics.

The following considers whether the majority of survey respondents in treatment and control villages answered 'yes', 'sometimes' or 'no' across all modules when asked whether they had difficulty paying for items in table 3.3.

The majority of survey respondents in treatment and control villages answered 'yes' when asked whether paying for items in the educational module was difficult. For instance, 78 percent, 74 percent and 75 percent of treatment village clients answered 'yes' when asked whether paying for school fees, stationary and children's pocket money was difficult (figure 3.3). In comparison, across clients in control villages (figure 3.3), the percentage of people answering 'yes' was slightly greater across all these items (86 percent for school fees, 76 percent for stationary and 80 percent for children's pocket money).

[49] Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

Figure 3.3: Perceptions of Difficulty Involving Payments for Educational Items across Treatment (T) and Control (C) Groups[50]



The high level of difficulty associated with paying for school fees is understandable as they are expensive (UNICEF 2006). Similarly pocket money for children, who may use money to buy lollies and food, may also be expensive. This expense becomes more pronounced if lunch is purchased from the canteen on a regular basis. However the high level of difficulty associated with paying for stationary related items is surprising. It is possible children continuously require pens and pencils in addition to the more expensive calculators and hole punchers.

Approximately 60 percent and 62 percent of survey respondents in treatment villages respectively answered 'yes' when asked whether payments relating to school shoes and school books was difficult (figure 3.3). This percentage in control villages increases to 66 percent for school shoes, and 72 percent for school books (figure 3.3). Relative to school fees and children's pocket money, the percentage of people answering 'yes' to these items may be lower because text books and shoes are shared and sold second hand between students and members of the same family. This explanation is plausible due to the 'won-tok' system prevalent in the Solomon Islands.

[50] Figure 3.3 illustrates the percentage of treatment (T) and control village (C) respondents who answered "yes", "sometimes" and "no" when asked, "did your household experience difficulty paying for educational related items in the last 12 months".

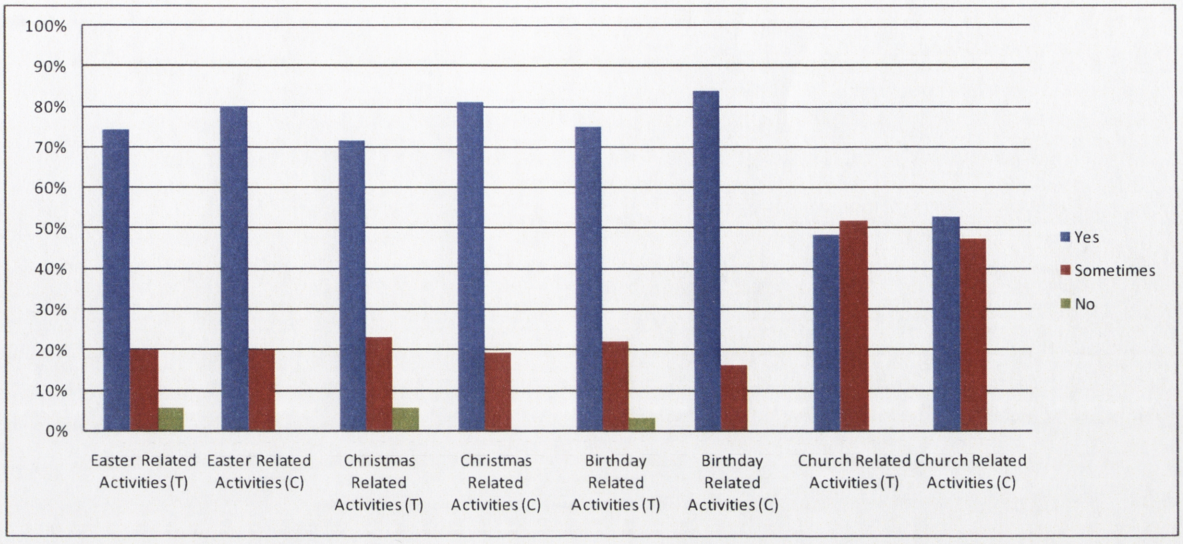
While the majority of people answered 'yes' when asked was it difficult to pay for items in the education module, an exception appears to be that approximately 63 percent of all respondents stated that it was 'sometimes' difficult paying for school clothes (figure 3.3). People may find purchases of school clothes relatively easier as they occur largely through second hand dealings within the community[51] such as being purchased or gifted from a friend who no longer requires them. Further, school clothing items, such as t-shirts, socks and shorts are not very expensive.

Similar to the education module, the majority of survey respondents in treatment and control villages answered 'yes' when asked whether paying for items in the events module was difficult. To illustrate, 74 percent, 72 percent and 75 percent of survey respondents in treatment villages answered 'yes' when asked whether paying for Easter, Christmas and birthday related activities was difficult (figure 3.4). For survey respondents in control villages, the percentage of people answering 'yes' was greater across all these items by between 5 and 10 percent relative to people in treatment villages. An exception appears to be that survey respondents are approximately evenly split between answering 'yes' and 'sometimes' when asked whether payments relating to church related activities was difficult.

The difference in difficulty involved with payments related to Easter, Christmas and birthday related activities compared with church related activities may be due to differences in costs and frequency of payments. Church activities represent low monetary value voluntary contributions; if people are short of money they can forgo contributing money for a week. Conversely, due to the 'won-tok' system, people are expected to provide gifts to friends and family. This requires a fixed price commitment, and hence, Christmas, Easter and birthday related expenses involve a greater cost. Consequently, it is reasonable to expect more people answer 'yes' when asked if it is difficult to pay for Christmas, Easter and birthday related presents relative to church related activities.

[51] This was verified during the pre-survey research phase.

Figure 3.4: Perceptions of Difficulty Involving Payments for Event Related Activities across Treatment (T) and Control (C) Groups[52]

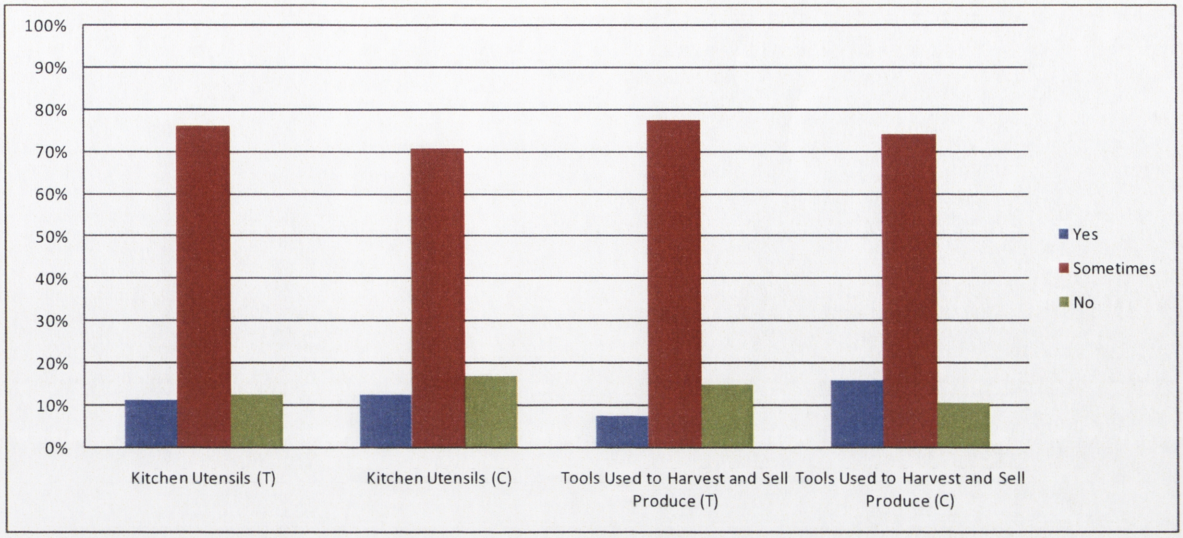


As opposed to the education and events modules where people generally answered 'yes' when asked was it difficult paying for particular items, approximately 74 percent of survey respondents in treatment and control villages suggested that it was 'sometimes' difficult to pay for kitchen utensils and tools used to harvest and sell produce (figure 3.5). This is reasonable as relative to other payments, expenditure on kitchen utensils, such as infrequent purchases of cutlery or plates is inexpensive. Similarly payments relating to tools used to harvest and sell produce appear predominately to be for inexpensive items[53]. It is likely costs largely relate to those involved in transporting items into town; such costs are shared between members of the community.

[52] Figure 3.4 illustrates the percentage of treatment (T) and control village (C) respondents who answered "yes", "sometimes" and "no" when asked, "did your household experience difficulty paying for events related items in the last 12 months".

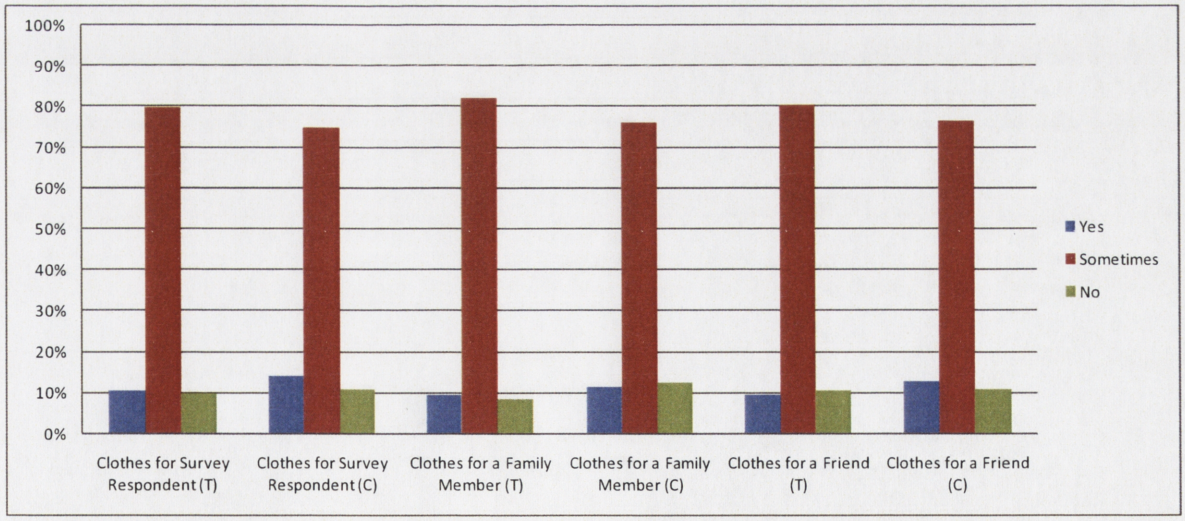
[53] Tools used to harvest and sell produce involve items such as shovels, picks and spades. Additionally the cost of transporting produce was also included as an answer to this question. Hence it would have been more appropriate to describe this item as costs involved in harvesting and selling produce. Nevertheless, interviewers were asked to ensure transport costs were included in the definition of tools used to harvest and sell produce. The ambiguity in the definition makes it difficult to ascertain whether payments largely related to inexpensive or expensive items.

Figure 3.5: Perceptions of Difficulty Involving Payments for Kitchen Utensils and Tools across Treatment (T) and Control (C) Groups[54]



Finally, approximately 80 percent and 76 percent of survey respondents in treatment and control villages respectively suggested that it was 'sometimes' difficult to pay for items in the clothing module (figure 3.6). This can at least partly be attributed to the fact that most items of clothing in the Solomon Islands are second hand and relatively inexpensive[55].

Figure 3.6: Perceptions of Difficulty Involving Payments for Clothes across Treatment (T) and Control (C) Groups[56]



[54] Figure 3.5 illustrates the percentage of treatment (T) and control village (C) respondents who answered "yes", "sometimes" and "no" when asked, "did your household experience difficulty paying for kitchen utensils and tools used to harvest and sell produce in the last 12 months".

[55] There was no shop in the Solomon Islands that sold new clothes.

[56] Figure 3.6 illustrates the percentage of treatment (T) and control village (C) respondents who answered "yes", "sometimes" and "no" when asked, "did your household experience difficulty paying for clothing items in the last 12 months".

3.5 Results

This section first considers aggregate results (tables 3.4 to 3.6a), then considers whether access to formal savings facilities has encouraged households to commit to saving more (tables 3.7 and 3.8) and finally analyses heterogeneous results (tables 3.11 to 3.13)[57]. Further, tables 3.C1 to 3.C1b, illustrated in Appendix 3C, highlight the aggregate results when undertaking regressions using ordered probit specifications[58]. Note the number of observations (or data used) varies depending on whether survey respondents (interviewees) answer 'yes' or 'no' when asked whether household members spent money on a particular item (illustrated in table 3.3) in the last 12 months.

3.5.1 Aggregate Results

Results demonstrate welfare impacts of intervention[59] are mixed across and within different modules[60]. On average, intervention appears to have a positive significant impact by reducing the difficulty involved in paying for some items in the education module, most items in the events module and tools used to harvest and sell produce. On average, intervention fails to have a significant impact on the difficulty involved in paying for kitchen utensils and purchase of clothes.

Table 3.4 indicates intervention significantly decreases the difficulty involved in paying for school fees, school shoes and school books by 7.7 percent, 7.2 percent and 10.8 percent respectively. Note a positive coefficient change implies the difficulty associated with paying for items is *lower*[61]. Table 3.4a illustrates the treatment variables maintain similar levels of significance, directional impact and magnitudes when using a binary probit model.

[57] Tables 3.9 and 3.10 represent the results of balance tests (discussed later in this section).

[58] Under these specifications, D_{ki} in equation 3.1 equals 1 if a survey respondent answered 'yes', 2 if a survey respondent answered 'sometimes' and 3 if a survey respondent answered 'no' when asked, in the last 12 months, did household members have any difficulty paying for a particular item listed in table 3. The levels of significance for the treatment dummies across all items are similar between the ordered probit and probit models.

[59] When testing the effects of time exposed to treatment, results suggest that the impact of intervention was not consistently different among people who opened savings accounts earlier than those who opened savings accounts later. Instead, impact of intervention across items was at times more and at times less significant among people who opened savings accounts earlier relative to those who opened savings accounts later.

[60] If all people who answered no when asked "did the household had purchased an item in the last 12 months" had 100% difficulty, the majority of variables will retain a similar level of significance and directional impact (only two variables became insignificant). Refer Appendix 3D for further details.

[61] As ordered responses for the dependent variable increase from 0 to 1, perceptions of difficulty are reduced.

Table 3.4 - Impact of Intervention on Dependent Variables Relating to Education

OLS

All Survey Respondents

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Treatment Dummy	**0.077***	**0.072***	**0.108****	-0.011	0.016	0.043
	(0.039)	(0.039)	(0.041)	(0.035)	(0.036)	(0.033)
Number of Children	-0.014	0.031	-0.003	0.013	0.031	-0.001
	(0.023)	(0.032)	(0.030)	(0.034)	(0.030)	(0.017)
Number of Children Going to School	0.039	-0.003	-0.003	-0.029	-0.016	**-0.049****
	(0.029)	(0.041)	(0.038)	(0.049)	(0.045)	(0.023)
Food Consumed "	**0.025*****	-0.002	0.005	0.007	-0.009	-0.006
	(0.006)	(0.010)	(0.010)	(0.009)	(0.010)	(0.005)
Roof Quality ^^	**0.083***	**0.138***	0.082	0.032	0.035	-0.005
	(0.040)	(0.071)	(0.062)	(0.055)	(0.047)	(0.043)
Wall Quality ^^	0.022	-0.050	0.006	-0.030	-0.052	0.048
	(0.038)	(0.068)	(0.054)	(0.051)	(0.046)	(0.033)
Number of Bedrooms ^^	-0.069	0.036	0.068	-0.054	-0.009	-0.050
	(0.045)	(0.055)	(0.077)	(0.051)	(0.071)	(0.050)
Interviewee's Age	-0.001	**0.007****	**0.005****	0.000	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Male	0.008	**0.132****	0.091	-0.009	-0.008	0.032
	(0.054)	(0.054)	(0.071)	(0.072)	(0.053)	(0.047)
Interviewee's Education Level ^^^	-0.010	-0.002	-0.018	-0.052	0.010	**0.056****
	(0.026)	(0.036)	(0.028)	(0.031)	(0.031)	(0.017)
Income Change"' (self reported)	**0.102****	**0.069***	**0.137****	**0.132****	0.044	0.039
	(0.026)	(0.036)	(0.036)	(0.041)	(0.041)	(0.031)
Distance to Village ^^^^	0.013	0.025	-0.040	0.024	-0.002	-0.005
	(0.055)	(0.066)	(0.067)	(0.048)	(0.055)	(0.049)
Data Used^	449	425	442	449	449	449
Mean Value of Dependent Variable	0.183	0.374	0.337	0.668	0.254	0.227
Adjusted R^2	0.053	0.027	0.030	0.011	0.016	0.040

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.4a - Impact of Intervention on Dependent Variables Relating to Education
Binary Probit
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Marginal Effects (Treatment Dummy)	**0.084****	**0.073***	**0.109****	-0.011	0.016	0.045
Treatment Dummy	**0.355****	**0.196***	**0.303****	-0.029	0.050	0.159
	(0.160)	(0.107)	(0.115)	(0.095)	(0.110)	(0.112)
Number of Children	-0.066	0.087	-0.006	0.040	0.097	-0.006
	(0.105)	(0.087)	(0.081)	(0.100)	(0.084)	(0.053)
Number of Children Going to School	0.158	-0.011	-0.010	-0.085	-0.050	**-0.172****
	(0.119)	(0.110)	(0.106)	(0.140)	(0.128)	(0.083)
Food Consumed "	**0.103*****	-0.006	0.013	0.020	-0.028	-0.019
	(0.025)	(0.026)	(0.028)	(0.023)	(0.032)	(0.019)
Roof Quality ^^	**0.342****	**0.381***	0.245	0.088	0.109	-0.022
	(0.163)	(0.197)	(0.180)	(0.149)	(0.149)	(0.146)
Wall Quality ^^	0.112	-0.129	0.024	-0.087	-0.167	0.159
	(0.154)	(0.186)	(0.153)	(0.141)	(0.142)	(0.114)
Number of Bedrooms ^^	-0.270	0.095	0.188	-0.155	-0.035	-0.194
	(0.185)	(0.145)	(0.208)	(0.138)	(0.220)	(0.206)
Interviewee's Age	-0.003	**0.020*****	**0.014****	-0.001	-0.002	0.003
	(0.009)	(0.006)	(0.006)	(0.007)	(0.006)	(0.009)
Male	0.021	**0.368****	0.264	-0.023	-0.023	0.109
	(0.209)	(0.146)	(0.198)	(0.201)	(0.167)	(0.157)
Interviewee's Education Level ^^^	-0.039	-0.003	-0.048	-0.147	0.033	**0.191****
	(0.107)	(0.096)	(0.078)	(0.090)	(0.096)	(0.059)
Income Change"' (self reported)	**0.418*****	**0.192****	**0.389*****	**0.375****	0.139	0.139
	(0.107)	(0.094)	(0.102)	(0.119)	(0.126)	(0.115)
Distance to Village ^^^^	0.080	0.068	-0.110	0.064	-0.004	-0.002
	(0.215)	(0.180)	(0.185)	(0.135)	(0.172)	(0.165)
Data Used^	449	425	442	449	449	449
Mean Value of Dependent Variable	0.183	0.374	0.337	0.668	0.254	0.227

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient makes it more likely that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.5 highlights intervention significantly decreases the difficult involved in paying for Easter, Christmas and birthday related presents by 6.6 percent, 10.0 percent and 9.6 percent respectively. However influence of intervention is insignificant regarding difficulty associated with payments for church activities. Table 3.5a illustrates the treatment variables maintain similar levels of significance, directional impact and magnitudes when using a binary probit model.

While intervention had a positive significant impact on some items in the schooling and events modules, table 3.6 demonstrates when estimating welfare impacts of intervention across clothes, impact is insignificant. This insignificance also applies to payments relating to kitchen utensils. However intervention significantly decreases the difficulty associated with paying for tools used to harvest and sell produce by 8.5 percent. Table 3.6a illustrates the treatment variables maintain similar levels of significance, directional impact and magnitudes when using a binary probit model.

Results suggest people save to pay for less frequent higher value items. For instance, payments relating to children's school fees, school books, Christmas, Easter and birthdays generally represent one-off annual payments and are of higher perceived value due to the emphasis placed on education and religion in the Solomon Islands. The focus on less frequent higher value items is not surprising considering each withdrawal costs 6 Solomon Dollars thus imposing an explicit cost from withdrawing money frequently.

Conversely, for payments relating to lower value more frequent items, intervention does not appear to have the same impact. To illustrate, influence of intervention is insignificant when involving purchases of kitchen utensils, expenditure on school stationary, children's pocket money and the almost weekly payment of church activities. Similarly intervention does not appear to influence difficulty associated with paying for school clothes and other clothing items[62].

[62] Note, people in the Solomon Islands generally sell second hand clothing items.

Table 3.5: Impact of Intervention on Dependent Variables Relating to Events
OLS
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Treatment Dummy	**0.066***	**0.100****	**0.096****	0.044
	(0.034)	(0.033)	(0.042)	(0.044)
Number of Children	**-0.031****	-0.002	-0.006	-0.006
	(0.015)	(0.007)	(0.014)	(0.019)
Food Consumed ''	0.002	0.006	-0.010	-0.005
	(0.012)	(0.008)	(0.007)	(0.008)
Roof Quality ^^	0.037	0.033	0.008	0.001
	(0.028)	(0.035)	(0.029)	(0.039)
Wall Quality ^^	0.067	**0.097****	0.050	-0.013
	(0.040)	(0.041)	(0.038)	(0.063)
Number of Bedrooms ^^	-0.035	-0.047	0.048	0.024
	(0.066)	(0.070)	(0.060)	(0.085)
Interviewee's Age	0.002	0.000	0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Male	-0.022	-0.020	0.000	0.073
	(0.048)	(0.050)	(0.047)	(0.057)
Interviewee's Education Level ^^^	-0.012	-0.037	0.004	-0.053*
	(0.023)	(0.027)	(0.020)	(0.026)
Income Change''' (self reported)	0.015	0.033	0.037	0.008
	(0.031)	(0.029)	(0.026)	(0.027)
Distance to Village ^^^^	**0.135****	**0.113****	0.005	0.011
	(0.043)	(0.051)	(0.047)	(0.051)
Data Used^	470	471	473	475
Mean Value of Dependent Variable	0.232	0.242	0.211	0.495
Adjusted R^2	0.021	0.023	-0.001	-0.011

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

'' If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

''' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.5a: Impact of Intervention on Dependent Variables Relating to Events
Binary Probit
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Marginal Effects (Treatment Dummy)	**0.068****	**0.099****	**0.096****	0.0441
Treatment Dummy	**0.232****	**0.329****	**0.349****	0.111
	(0.118)	(0.110)	(0.161)	(0.110)
Number of Children	**-0.109****	0.000	-0.018	-0.016
	(0.051)	(0.024)	(0.049)	(0.047)
Food Consumed ''	0.012	0.024	-0.037	-0.012
	(0.039)	(0.026)	(0.027)	(0.021)
Roof Quality ^^	0.129	0.106	0.034	0.004
	(0.094)	(0.117)	(0.105)	(0.097)
Wall Quality ^^	**0.224***	**0.320****	0.190	-0.033
	(0.135)	(0.135)	(0.129)	(0.157)
Number of Bedrooms ^^	-0.149	-0.163	0.157	0.059
	(0.254)	(0.256)	(0.203)	(0.215)
Interviewee's Age	0.008	0.002	-0.002	-0.003
	(0.008)	(0.006)	(0.006)	(0.006)
Male	-0.074	-0.057	-0.007	0.184
	(0.156)	(0.166)	(0.162)	(0.142)
Interviewee's Education Level ^^^	-0.046	-0.121	0.011	**-0.134****
	(0.075)	(0.086)	(0.069)	(0.065)
Income Change''' (self reported)	0.067	0.111	0.138	0.020
	(0.108)	(0.100)	(0.096)	(0.069)
Distance to Village ^^^^	**0.457****	**0.339****	0.009	0.029
	(0.148)	(0.159)	(0.160)	(0.127)
Data Used^	470	471	473	475
Mean Value of Dependent Variable	0.232	0.242	0.211	0.495

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient makes it more likely that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

'' If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

''' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.6: Impact of Intervention on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes

OLS

All Survey Respondents

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Treatment Dummy	0.016	**0.085****	0.042	0.021	0.034
	(0.021)	(0.024)	(0.022)	(0.027)	(0.030)
Food Consumed "	-0.001	0.000	-0.005	0.002	-0.002
	(0.007)	(0.007)	(0.005)	(0.005)	(0.007)
Roof Quality ^^	0.053	**0.057***	-0.005	0.014	0.008
	(0.034)	(0.029)	(0.032)	(0.021)	(0.035)
Wall Quality ^^	-0.010	0.000	0.040	0.003	0.000
	(0.030)	(0.034)	(0.033)	(0.028)	(0.039)
Number of Bedrooms ^^	0.003	-0.022	0.004	-0.037	-0.012
	(0.047)	(0.037)	(0.048)	(0.042)	(0.046)
Interviewee's Age	0.001	-0.002	-0.001	-0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Male	-0.014	-0.006	-0.012	0.020	0.042
	(0.033)	(0.034)	(0.041)	(0.034)	(0.036)
Interviewee's Education Level ^^^	-0.018	-0.017	-0.026	-0.016	-0.002
	(0.021)	(0.021)	(0.017)	(0.019)	(0.017)
Income Change"' (self reported)	0.009	-0.003	-0.026	-0.026	0.002
	(0.024)	(0.018)	(0.034)	(0.030)	(0.028)
Distance to Village ^^^^	0.045	0.049	0.005	**0.087***	0.068
	(0.026)	(0.030)	(0.042)	(0.044)	(0.051)
Data Used^	477	478	479	478	467
Mean Value of Dependent Variable	0.883	0.889	0.879	0.897	0.891
Adjusted R^2	-0.008	0.011	-0.007	0.000	-0.010

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.6a: Impact of Intervention on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes
Binary Probit
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Marginal Effects (Treatment Dummy)	0.020	**0.087****	0.043	0.023	0.036
Treatment Dummy	0.102	**0.477*****	0.214	0.134	0.195
	(0.109)	(0.119)	(0.112)	(0.144)	(0.161)
Food Consumed ''	-0.008	-0.001	-0.024	0.013	-0.010
	(0.034)	(0.035)	(0.026)	(0.031)	(0.035)
Roof Quality ^^	**0.280***	**0.323****	-0.026	0.095	0.037
	(0.163)	(0.156)	(0.155)	(0.118)	(0.184)
Wall Quality ^^	-0.051	-0.019	0.213	0.021	0.005
	(0.157)	(0.182)	(0.173)	(0.163)	(0.204)
Number of Bedrooms ^^	0.018	-0.099	0.005	-0.192	-0.064
	(0.248)	(0.174)	(0.234)	(0.202)	(0.226)
Interviewee's Age	0.004	-0.008	-0.006	-0.005	0.001
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Male	-0.061	-0.040	-0.047	0.120	0.233
	(0.170)	(0.182)	(0.199)	(0.209)	(0.195)
Interviewee's Education Level ^^^	-0.093	-0.087	-0.125	-0.080	-0.006
	(0.101)	(0.105)	(0.082)	(0.101)	(0.083)
Income Change''' (self reported)	0.035	-0.034	-0.140	-0.142	0.012
	(0.121)	(0.106)	(0.157)	(0.155)	(0.147)
Distance to Village ^^^^	0.227	0.297	0.041	**0.514****	0.383
	(0.152)	(0.192)	(0.223)	(0.243)	(0.274)
Data Used^	477	478	479	478	467
Mean Value of Dependent Variable	0.883	0.889	0.879	0.897	0.891

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient makes it more likely that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

'' If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

''' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level. ** Significance at the 5 percent level. *** Significance at the 1 percent level.

Results indicate intervention reduces the difficulty associated with payments related to tools used to harvest and sell produce. As the value of these tools vary, they cannot be categorised as either high value infrequent items, such as shovels and carts, or lower value items such as spades or transport into town.

Other variables, in addition to intervention, also appear to influence difficulty involved in paying for particular items. Results in table 3.4 show the average interviewee living in wealthier households, as suggested by the food consumed, believes household members find it significantly less difficult to pay for school fees by 2.5 percent. Further, tables 3.4 and 3.6 reveal that the average interviewee living in wealthier households, as suggested by higher roof quality, believes household members find it significantly less difficult to pay for school fees, school shoes and tools used to harvest and sell produce by 8.3 percent, 13.8 percent and 5.7 percent respectively. Finally table 3.5 suggests that the average interviewee living in wealthier households, as demonstrated by higher wall quality, believes household members find it significantly less difficult to pay for Christmas related expenses by 9.7 percent. It is reasonable that wealthier households find it easier to pay for certain items.

The average household that experienced increased income in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey, finds it significantly less difficult to pay for the majority of the items in the education module (refer table 3.4). However such a correlation is not applicable to items in the other modules. Presumably this is because the indicator only illustrates the directional change in household income over time; it does not demonstrate the magnitude or relative change. Thus a household with 'increased' income in one year relative to the previous year does not necessarily imply its income has increased considerably or is higher relative to other households.

Results in table 3.5 reveal the average interviewee living in a household with more children believes household members find it insignificantly more difficult to pay for birthday, Christmas and Easter related expenses by 2.0 percent, 6.0 percent and 6.0 percent respectively, and significantly so for Easter related expenses by 3.1 percent. This is plausible due to the extra cost in paying for presents in households with more children.

The interviewee's age, sex and education level do not appear to significantly influence the difficulty associated in paying for most items. Exceptions, illustrated in table 3.4, are that the average older interviewee believes household members find it significantly less difficult to pay for school shoes and school books by 0.7 percent and 0.5 percent respectively and the average male interviewee believes household members find it significantly more difficult to pay for school shoes by 13.2 percent. As highlighted in table 3.5, the average interviewee with a higher level of education believes household members find it significantly more difficult to pay for church related expenses by 13.4 percent. Considering these variables do not significantly influence payments of any other items, the uncertain economic rationale for such a correlation is considered immaterial.

Distance from the main road to the village does not appear to influence the dependent variables significantly across the majority of items. A few exceptions, illustrated in tables 3.5 and 3.6 are that on average, the *greater* the distance from the main road, the significantly less difficult it is to pay for Easter related expenses, Christmas related expenses and purchases of clothes for a family member by 13.5 percent, 11.3 percent and 8.7 percent respectively. This is surprising as it is expected that a greater distance between the main road and a village would make it *more* difficult to pay for certain items. As the distance to the main road does not appear to influence difficulty involved in paying for the large majority of items, the influence of distance overall is considered immaterial.

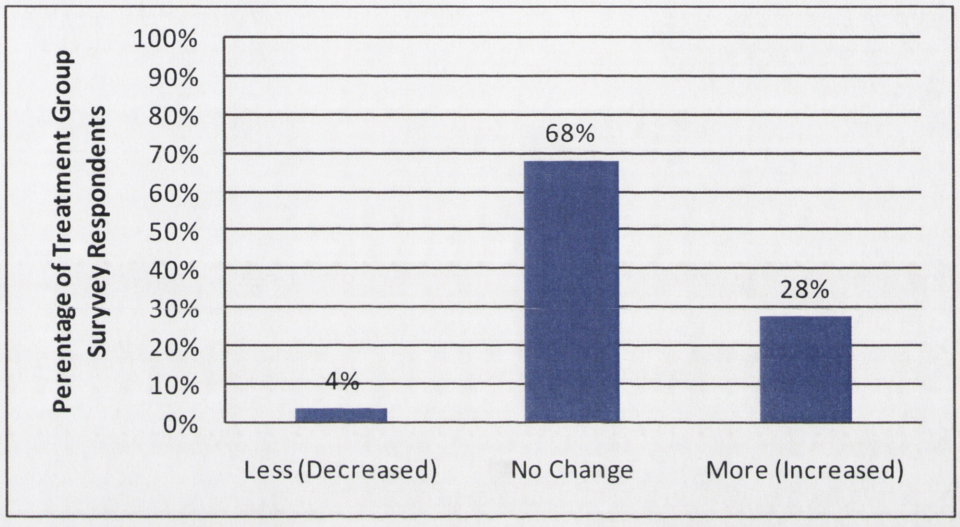
As explained in chapter 2 (literature review), there appears to be no empirical study that considers welfare impact of access to savings facilities from a similar subjective perceptive. Hence comparisons of these results with literature were not undertaken.

3.5.2 Commitment Savings vs Reallocation Savings

The following results consider whether treatment village households have 'saved more' (i.e. used formal savings facilities as commitment devices), experienced 'no change' (i.e. used formal savings facilities as reallocation devices) or 'saved less' due to access to formal savings facilities. As displayed in figure 3.7, 68 percent of treatment village clients (representing 184 people) stated that intervention made no difference to the amount of money the household saved. This likely implies that most people have re-distributed their

savings from traditional methods, such as keeping money 'under the mattress', to bank deposits without generating an overall net increase in savings. Indeed given this relatively large figure, and results suggesting savings is welfare enhancing across payments for higher value less frequent items, it may appear that savings maintained formally may be more welfare enhancing than savings maintained informally.

Figure 3.7: Has opening a savings account with ANZ encouraged the household to save more, less, or has not changed the amount the household normally would save?



Also in figure 3.7, 28 percent of treatment village clients (representing 74 people) claimed the household saved more money due to intervention while 4 percent claimed the household saved less money due to intervention. As the 4 percent only relate to 10 households, they represent a small minority and are unlikely to be reflective of overall program impact.

Interestingly, the formal savings facility appears of greater benefit to the 28 percent of treatment village households that have 'committed' by saving a larger amount as opposed to the 68 percent that simply 'reallocated' their initial cash. Consider the second last column in table 3.7; among people who stated their household saved 'more' with ANZ (i.e. used formals savings facilities as commitment devices), across items where access to formal savings facilities had an impact, 35 percent found it less difficult to pay for items. This number drops to 26 percent for people who stated there was 'no change' in their household savings patterns (i.e. used formal savings facilities as reallocation devices) and 10 percent for people who stated their household saved 'less'.

Indeed, across items where access to savings did not have an impact, the percentage of people who stated their household found it less difficult to pay for particular items also drops progressively from those who stated their household saved 'more' with ANZ to those who stated their household saved 'less' with ANZ (refer second last column, table 3.8), albeit to a smaller degree.

Note, there was an insignificant difference between the wealth proxies in households that saved 'more' and experienced 'no change' (refer table 3.9).

The finding that commitment savers experience greater welfare gains is similar to the finding in Ashraf *et al.* (2008) that female commitment savers feel more empowered. The magnitudes of results are not directly comparable as Ashraf *et al.* (2008) focuses on comparing commitment savers to normal savers while this study compares welfare of people with formal savings accounts to people who do not access formal savings accounts.

Table 3.7: Perceptions of Difficulty among Treatment Group Members using Formal Savings Facilities as Commitment Devices or Reallocation Devices across Items where Intervention had a Welfare Impact

Sample Frame: Treatment Group Members (268)

	Sample of Treatment Group	Percentage that did not Answer the Question Relating to Items*	Percentage Finding it More Difficult to Pay for Items**	Percentage Finding it Less Difficult to Pay for Items***	Total
Formal Savings Facilities reduced Total Savings^	10	12%	78%	10%	100%
Formal Savings Facilities used for Reallocation of Savings^^	184	5%	69%	**26%**	100%
Formal Savings Facilities used as Commitment Devices^^^	74	3%	61%	**35%**	100%

* Relates to the number of people who answered 'no' when asked if the household has spent money on school fees, school shoes, school books, Easter related items, Christmas related items and Birthday related items in the last 12 months. Note tools used to harvest and sell produce were omitted from the above analysis due to the ambiguity of the survey question.

** Average percentage of people who answered 'yes' when asked whether the household experienced difficulty paying for school fees, school shoes, school books, Easter related items, Christmas related items and Birthday related items in the last 12 months. These represents most items where there has been a welfare impact as illustrated in tables 3.4 to 3.6 and tables 3.B1 to 3.B3.

*** Average percentage of people who answered 'sometimes' and 'no' when asked whether the household experienced difficulty paying for school fees, school shoes, school books, Easter related items, Christmas related items and Birthday related items in the last 12 months. These represents items where there has been a welfare impact as illustrated in tables 3.4 to 3.6 and tables 3.B1 to 3.B3.

^ 10 treatment group members answered "Less" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?".

^^ 184 treatment group members answered "No Change" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?". This implies these households use formal savings facilities to 'reallocate' funds from informal savings to formal savings.

^^^ 74 treatment group members answered "More" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?". This implies these households use formal savings facilities as commitment devices.

Table 3.8: Perceptions of Difficulty among Treatment Group Members using Formal Savings Facilities as Commitment Devices or Reallocation Devices across Items where Intervention **did not** have a Welfare Impact

Sample Frame: Treatment Group Members (268)

	Sample of Treatment Group	Percentage that did not Answer the Question Relating to Items*	Percentage Finding it More Difficult to Pay for Items**	Percentage Finding it Less Difficult to Pay for Items***	Total
Formal Savings Facilities reduced Total Savings^	10	9%	35%	56%	100%
Formal Savings Facilities used for Reallocation of Savings^^	184	3%	34%	**64%**	100%
Formal Savings Facilities used as Commitment Devices^^^	74	1%	28%	**71%**	100%

* Relates to the number of people who answered 'no' when asked if the household has spent money on school clothes, stationary, church related expenses, kitchen utensils, clothes purchased for the interviewee, clothes purchased for a family member and clothes purchased for a friend in the last 12 months.

** Average percentage of people who answered 'yes' when asked whether the household experienced difficulty paying for school clothes, stationary, church related expenses, kitchen utensils, clothes purchased for the interviewee, clothes purchased for a family member and clothes purchased for a friend in the last 12 months. These represents items where there has been no welfare impact as illustrated in tables 3.4 to 3.6 and tables 3.B1 to 3.B3.

*** Average percentage of people who answered 'sometimes' and 'no' when asked whether the household experienced difficulty paying for school fees, school shoes, school books, Easter related items, Christmas related items and Birthday related items in the last 12 months. These represents most items where there has been no welfare impact as illustrated in tables 3.4 to 3.6 and tables 3.B1 to 3.B3.

^ 10 treatment group members answered "Less" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?".

^^ 184 treatment group members answered "No Change" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?". This implies these households use formal savings facilities to 'reallocate' funds from informal savings to formal savings.

^^^ 74 treatment group members answered "More" when asked "Has opening a savings account with ANZ encouraged the household to save more, less, or hasn't changed the amount the household normally would save?". This implies these households use formal savings facilities as commitment devices.

Table 3.9 - Balance Test of Wealth Characteristics across Treatment Group Members Only
Sample Frame: Commitment Savers (74) and Reallocation Savers (184)
T-test

	Reallocation Savers		Commitment Savers		Balance Test	
	Mean	S.E.	Mean	S.E.	T-Test	P-Value
Food Quality^	12.337	2.126	12.216	2.089	0.415	0.679
Roof^^	0.505	0.501	0.486	0.503	0.274	0.784
Wall^^	0.413	0.494	0.432	0.499	0.284	0.776
Bedroom^^	1.103	0.305	1.108	0.313	0.115	0.909

^ Food Quality compares 16 food items consumed within a week before the survey between reallocation savers and commitment savers. If any member of the household consumed any of the following items within a week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken within a week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

Why is the ANZ savings facility, which is designed as a commitment device, used mainly to reallocate funds as opposed to increase savings? This is potentially because Pacific Islanders generally use savings to reallocate wealth across different items as opposed to accumulating wealth. For instance, Liew (1997:3) contends "demand for cash is primarily to meet emergencies, for schooling, to meet traditional and religious obligations and for other basic necessities ... it is rarely for starting a microenterprise or income earning activity". More recently Shaw and Eversole (2008:16) has also stated "most savings were destined for ... education expenses, housing improvements and as a cushion for emergencies".

Results demonstrate that access to formal savings facilities reduces difficulty involving payments across lumpier items. Further, welfare impact is felt greater across households that commit to saving more relative to those that reallocate cash. Hence, the results support the hypothesis.

3.5.3 Heterogeneous Effects

The summary statistics by gender in table 3.10 illustrates female survey respondents are on average 29 years old and male survey respondents are on average 43 years old, female survey respondents are more educated than male survey respondents and there are a greater number of bedrooms in households with male survey respondents. These differences between males and females are significant at the 5 percent level. Further, at the 10 percent level, households with males as survey respondents have a slightly higher number of

children going to school. The difference in age is reasonable due to the survey methodology where enumerators targeted older males while the difference in education levels is also reasonable as education became more freely available over time. The reason why households with male respondents have more bedrooms and have slightly more children attending school is uncertain. All other differences between males and females are statistically insignificant.

To consider whether gender influences survey responses, the treatment dummy variable is interacted with the dummy variable for gender (which equals 1 if male). This approach to measuring heterogeneous effects is used throughout literature (Ashraf *et al.* 2006; Gerber *et al.* 2009). Due to their potential correlation with the dependent variable, the survey respondent's age, the survey respondent's education level, the number of bedrooms in a household and the number of children attending school are also interacted with the treatment dummy variable.

Results in tables 3.11, 3.12 and 3.13 illustrate that the sex of the survey respondent does not appear to influence the majority of answers to survey questions relating to the perceptions of difficulty involved in paying for particular items. The only exception is that male survey respondents in treatment villages suggest that the average household finds it less difficult to pay for school books by 22.2 percent at the 10 percent significance level (table 3.11).

Additionally, on average, across most items within treatment villages, the survey respondent's age, the survey respondent's education level, the number of bedrooms in a household and the number of children attending school do not significantly influence the dependent variables.

Table 3.10: Balance Test between Males and Females across Household Level Demographic Characteristics
Sample Frame: Males (270), Females (211)
T-test

	Females		Males		Balance Test		Comment***	Data Used****
	Mean	S.E.	Mean	S.E.	T-statistic	P-Value		
Demographic Characteristics								
People over 55	0.53	0.68	0.58	0.69	0.81	0.42	Number of ppl over 55 = 0,1,>1	0,1,2
Age of household head	43.84	8.87	45.00	8.64	1.43	0.15		
Education of household head	1.03	0.69	1.06	0.74	0.47	0.64	Primary, secondary, tertiary^	1,2,3
Number of people living in household	5.91	1.53	6.05	1.61	0.92	0.36		
Number of working adults^^	2.56	0.99	2.60	1.01	0.43	0.67		
Number of children	2.69	1.39	2.84	1.37	1.18	0.24		
Number of children going to school	2.28	1.24	2.49	1.25	**1.82***	0.07		
Dependency Ratio	0.45	0.16	0.44	0.16	0.27	0.79	No. of working adults/no.of people in household	
Children/Workers	1.25	0.90	1.32	1.00	0.75	0.45		
Number of people who don't work and don't go to school	1.07	0.82	0.94	0.82	1.62	0.11		
Age of survey respondent	29.02	7.25	43.07	9.68	**17.57****	0.00		
Education of survey respondent	1.56	0.58	1.15	0.78	**6.43****	0.00	Primary, secondary, tertiary^	1,2,3
Household quality								
Walls	0.45	0.50	0.46	0.50	0.20	0.84	Sago Palms, Timber	0,1
Roof	0.52	0.50	0.51	0.50	0.12	0.91	Sago Palms or Timber, Copper^^^^	0,1
Number of bedrooms	1.09	0.29	1.17	0.37	**2.47****	0.01	1, 2, 3 bedrooms or >3 bedrooms	1,2
Income Change ^^^ (self reported)	1.15	0.55	1.19	0.59	0.72	0.47		
Distance from villages to main road (kilometres)	1.09	0.33	1.10	0.34	0.48	0.63		

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.
^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively.
^^ Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.
^^^ Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income is denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey
^^^^ Households that had roofs made from Sago Palms or Timber are combined in the data set.
*** Comment refers to a comment made on the corresponding independent variable in the table.
**** "Data used" corresponds to the information in the comments section.

Table 3.11 - Impact of Intervention on Dependent Variables Relating to Education (Gender Analysis)

OLS

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Treatment Dummy	-0.075	-0.112	-0.230	0.066	0.204	0.163
	(0.207)	(0.270)	(0.259)	(0.259)	(0.241)	(0.230)
Male * Treatment Dummy	0.020	-0.157	**-0.222***	-0.148	0.005	0.117
	(0.097)	(0.126)	(0.121)	(0.121)	(0.113)	(0.108)
Interviewer's Age * Treatment Dummy	0.001	0.006	**0.010***	0.007	0.004	**-0.009***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Interviewer's Education Level * Treatment Dummy	**0.122****	0.026	-0.011	-0.030	-0.009	0.036
	(0.054)	(0.071)	(0.067)	(0.067)	(0.063)	(0.060)
Number of Children Going to School * Treatment Dummy	**-0.067***	-0.062	-0.015	-0.024	-0.046	0.006
	(0.034)	(0.045)	(0.043)	(0.043)	(0.040)	(0.038)
No. of Bedrooms * Treatment Dummy	0.112	0.149	0.141	-0.119	-0.190	0.077
	(0.108)	(0.143)	(0.137)	(0.135)	(0.126)	(0.120)
Number of Children	-0.014	0.031	-0.001	0.013	0.030	-0.001
	(0.028)	(0.037)	(0.035)	(0.035)	(0.033)	(0.031)
Number of Children Going to School	**0.080****	0.032	0.001	-0.018	0.012	-0.050
	(0.037)	(0.049)	(0.046)	(0.046)	(0.043)	(0.041)
Food Consumed "	**0.023****	-0.004	0.003	0.007	-0.009	-0.006
	(0.008)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Roof Quality ^^	**0.085****	**0.136****	**0.075***	0.030	0.035	0.001
	(0.036)	(0.047)	(0.045)	(0.045)	(0.042)	(0.040)
Wall Quality ^^	0.016	-0.059	-0.002	-0.031	-0.047	0.048
	(0.036)	(0.048)	(0.045)	(0.045)	(0.042)	(0.040)
Number of Bedrooms ^^	-0.122	-0.045	-0.010	-0.007	0.071	-0.072
	(0.076)	(0.101)	(0.096)	(0.096)	(0.089)	(0.085)
Interviewee's Age	-0.001	0.003	-0.001	-0.004	-0.003	**0.006***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Male	-0.028	-0.048	0.040	0.093	-0.002	-0.102
	(0.075)	(0.097)	(0.093)	(0.094)	(0.087)	(0.083)
Interviewee's Education Level ^^^	**-0.086****	-0.020	-0.011	-0.037	0.012	0.035
	(0.042)	(0.056)	(0.052)	(0.053)	(0.049)	(0.047)
Income Change"' (self reported)	**0.110*****	0.074	**0.136*****	**0.134*****	0.048	0.041
	(0.031)	(0.041)	(0.039)	(0.039)	(0.037)	(0.035)
Distance to Village ^^^^	0.023	0.033	-0.035	0.031	0.005	-0.008
	(0.054)	(0.070)	(0.068)	(0.068)	(0.063)	(0.060)
Data Used^	449	425	442	449	449	449
Mean Value of Dependent Variable	0.183	0.374	0.337	0.668	0.254	0.227
Adjusted R^2	0.062	0.026	0.030	0.008	-0.009	0.014

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard errors not corrected for robustness. Robust standard errors produce the same reported levels of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the

'" Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set.

* Significance at the 10 percent level, ** Significance at the 5 percent level, * Significance at the 1 percent level.

Table 3.12: Impact of Intervention on Dependent Variables Relating to Events (Gender Analysis)

OLS

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Treatment Dummy	0.046	0.032	-0.195	0.037
	(0.220)	(0.222)	(0.213)	(0.264)
Male * Treatment Dummy	-0.084	0.129	-0.023	0.029
	(0.106)	(0.107)	(0.102)	(0.127)
Interviewer's Age * Treatment Dummy	0.001	0.002	0.003	-0.003
	(0.005)	(0.005)	(0.004)	(0.006)
Interviewer's Education Level * Treatment Dummy	-0.043	0.008	0.063	-0.005
	(0.058)	(0.058)	(0.056)	(0.069)
Number of Children Going to School * Treatment Dummy	**0.057***	0.019	-0.023	-0.034
	(0.033)	(0.034)	(0.032)	(0.040)
No. of Bedrooms * Treatment Dummy	-0.059	-0.105	0.136	0.167
	(0.124)	(0.124)	(0.119)	(0.147)
Number of Children	**-0.052***	-0.042	-0.016	-0.013
	(0.031)	(0.031)	(0.030)	(0.036)
Number of Children Going to School	-0.007	0.041	0.027	0.029
	(0.038)	(0.038)	(0.037)	(0.046)
Food Consumed "	0.003	0.007	-0.012	-0.006
	(0.009)	(0.009)	(0.008)	(0.010)
Roof Quality ^^	0.039	0.035	0.005	0.001
	(0.039)	(0.040)	(0.038)	(0.047)
Wall Quality ^^	**0.068***	**0.101****	0.045	-0.016
	(0.039)	(0.040)	(0.039)	(0.047)
Number of Bedrooms ^^	-0.002	0.000	-0.022	-0.058
	(0.087)	(0.088)	(0.084)	(0.104)
Interviewee's Age	0.001	0.000	-0.002	0.000
	(0.003)	(0.004)	(0.003)	(0.004)
Male	0.080	-0.055	0.012	-0.096
	(0.082)	(0.082)	(0.079)	(0.098)
Interviewee's Education Level ^^^	0.013	-0.043	-0.033	-0.050
	(0.045)	(0.045)	(0.044)	(0.054)
Income Change"' (self reported)	0.010	0.028	0.038	0.008
	(0.034)	(0.035)	(0.034)	(0.041)
Distance to Village ^^^^	**0.133****	**0.114***	0.008	0.007
	(0.058)	(0.059)	(0.057)	(0.070)
Data Used^	470	471	473	475
Mean Value of Dependent Variable	0.232	0.242	0.211	0.495
Adjusted R^2	0.014	0.022	-0.005	-0.017

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard errors not corrected for robustness. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 3.13: Impact of Intervention on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes (Gender Analysis)

OLS

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Treatment Dummy	0.180	0.207	**0.357*** **	0.145	0.158
	(0.169)	(0.163)	(0.173)	(0.158)	(0.165)
Male * Treatment Dummy	0.086	0.000	0.061	0.043	-0.071
	(0.081)	(0.078)	(0.081)	(0.076)	(0.079)
Interviewer's Age * Treatment Dummy	-0.004	0.000	**-0.006***	-0.003	-0.003
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)
Interviewer's Education Level * Treatment Dummy	-0.030	0.018	0.061	0.018	0.065
	(0.044)	(0.043)	(0.045)	(0.042)	(0.043)
Number of Children Going to School * Treatment Dummy	-0.012	-0.025	**-0.044***	-0.022	-0.015
	(0.025)	(0.025)	(0.025)	(0.024)	(0.025)
No. of Bedrooms * Treatment Dummy	-0.005	-0.063	-0.092	0.002	-0.032
	(0.094)	(0.090)	(0.094)	(0.088)	(0.091)
Number of Children Going to School	-0.016	-0.005	0.018	-0.004	-0.005
	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)
Food Consumed "	0.000	0.001	-0.004	0.003	-0.002
	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)
Roof Quality ^^	**0.054***	**0.058****	-0.001	0.016	0.013
	(0.030)	(0.029)	(0.030)	(0.028)	(0.029)
Wall Quality ^^	-0.007	0.001	0.038	0.003	-0.004
	(0.030)	(0.029)	(0.030)	(0.028)	(0.030)
No. of Bedrooms ^^	0.029	0.027	0.064	-0.017	0.025
	(0.067)	(0.063)	(0.066)	(0.062)	(0.064)
Interviewee's Age	0.003	-0.001	0.002	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Male	-0.037	0.003	-0.034	-0.049	-0.006
	(0.062)	(0.060)	(0.063)	(0.058)	(0.062)
Interviewee's Education Level ^^^	0.000	-0.029	**-0.065***	-0.027	-0.043
	(0.034)	(0.033)	(0.035)	(0.032)	(0.033)
Income Change"' (self reported)	0.018	0.007	-0.015	-0.016	0.014
	(0.026)	(0.025)	(0.026)	(0.025)	(0.026)
Distance to Village ^^^^	0.036	0.051	0.012	**0.085****	**0.077***
	(0.045)	(0.043)	(0.045)	(0.042)	(0.044)
Data Used^	477	478	479	478	467
Mean Value of Dependent Variable	0.883	0.889	0.879	0.897	0.891
Adjusted R^2	(0.009)	0.009	0.005	-0.004	-0.001

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard errors not corrected for robustness. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set.

* Significance at the 10 percent level, ** Significance at the 5 percent level, * Significance at the 1 percent level.

3.6 Limitations

Limitations relating to non-random program placement and selection of program participants as well as potential bias from omitted variables have been discussed. Further, as no other microfinance or rural banking operations are undertaken in the surveyed villages, and as no clients have closed their bank accounts, substitution bias and bias relating to program dropouts will not be problematic.

Another possible limitation is that some demographic characteristics considered time-invariant in tables 3.1 to 3.13 may be time variant. For example, during the intervention period but before the survey was taken, the number of total household members may change due to births or deaths, more people may turn 55, or people who are over 55 may have passed away. Similarly, the number of working adults may also change due to new adults deciding to work and due to existing adults entering or exiting the work force. Further, some children may die or become adults while others may enter or exit educational institutions. Ideally more questions to ascertain whether such characteristics were time variant should have been asked when undertaking the survey.

Levels of education may change and the age of survey respondents will change during the intervention period. The change in age is unlikely problematic as it occurs uniformly over all respondents. Additionally, as most of the survey respondents are over 25 years of age, it is unlikely the levels of education will change greatly over the intervention period. Finally, in relation to household quality, respondents were asked to confirm household characteristics existing now were the same as those that existed pre-intervention, between January 2006 and mid-March 2006.

Ultimately, it is difficult to account for potential time variance of all observable characteristics in a cross-sectional setting. It is assumed that changes to observable characteristics over time, if they occur, will be on average statistically similar between treatment and control villages. Note, some of the potential time variant variables used in this study are assumed as time invariant in other cross-sectional evaluations (see for example Niño-Zarazúa 2007).

Additionally there are other potential limitations relating to fungibility of money and spillovers. Firstly, the fungibility of money implies that savings can be used for many different purposes and influence many different activities. Consequently, it is likely that the dependent variables used in the study do not comprehensively capture all welfare impacts from access to savings accounts, potentially upwardly or downwardly biasing results. Failing to account for all potential uses of savings is a limitation of this study and other studies in literature[63]. Secondly, opening formal savings accounts may also have spillover effects. For instance, this intervention may reduce the reliance on informal savings such as deposits with friends and family. This may create welfare gains, as people are not burdened with ensuring the safety of savings, or may create welfare losses, as it reduces the social interaction between people.

Finally the study does not focus on other regions. This is a limitation of most quasi-experimental designs that evaluate an existing program focusing on a particular area (see for example MkNelly and Lippold 1998). Nevertheless, *a-priori*, there appears to be no reason why such results are not representative of those across other areas of Guadalcanal.

3.7 Conclusion

This study is the first to test welfare impacts from access to formal savings facilities in a Pacific Island country. Results suggest welfare impact across payments relating to high value low frequency items supports theoretical literature suggesting access to formal savings accounts is indeed welfare enhancing. Conversely, for payments relating to lower value more frequent items, access to formal savings accounts does not appear to have the same impact.

Further, the majority of households with treatment village clients appear to use formal savings facilities to reallocate funds (68 percent) while a large minority of households with treatment village clients appear to use formal savings facilities as commitment devices (28 percent). Across items that have a welfare impact, the households that use formal savings

[63] For example, the dependent variables used by Ashraf *et al.* (2006) are also unlikely to capture all potential uses of savings.

as commitment devices find payments relating to particular items less difficult relative to households that use formal savings facilities as reallocation devices.

Hence, results suggest welfare will be most greatly enhanced when formal savings facilities are used as commitment devices and payment tools for lumpier items.

There are some important caveats to the above results. Firstly, bias from non-random program placement may occur if any differences between the average treatment and control village pre-intervention, the slightly higher quality of roads leading to treatment villages relative to control villages during a seven month period, and the slightly closer proximity of treatment villages to Honiara relative to control villages, influences the difficulty associated with paying for selected items in treatment and control village client households. Secondly, selection bias would occur if control village clients refused to open savings accounts *if* given the option to open savings accounts at time 1 (when treatment village clients opened their savings accounts). Selection bias would also occur if non-clients in control villages, who were not included in the analysis, would have opened savings accounts when treatment village clients opened their savings accounts. While these issues relating to non-random program placement and selection bias were considered, given the cross-sectional nature of the study, they cannot completely be eliminated.

Additionally, all potential welfare impacts from access to formal savings facilities may not have been considered. For example, given the fungibility of money, savings could have been used for multiple purposes not considered as part of this study's dependent variables. Similarly, there may be spillover effects influencing the community that were not considered.

Hence instead of providing conclusive evidence of positive welfare impacts from access to formal savings facilities, this study should complement more rigorous multi-period longitudinal studies. Ultimately results of this study should encourage policy makers to consider focusing more resources on evaluating the influence of access to formal savings facilities across other areas in the Solomon Islands and other Pacific Island countries. If such analysis supports results presented in this study, a variety of policy options could follow.

For instance, a possible policy option may involve encouraging microfinance institutions to require that their clients actively and regularly save for a particular period of time before providing loans. ANZ's rural banking team in the Solomon Islands argue their requirement that clients actively and regularly deposit money for six months prior to issuing an initial loan is one of the main reasons why bad debts are kept at less than 2 percent. Hence if opening up formal savings facilities can reduce long-term cost through ensuring high loan repayment rates *and* improve the welfare of its clients, then it may be prudent to encourage such actions.

Another potential policy option is to increase public/private partnerships. In this study, upgrading roads leading into villages had the immediate effect of supporting the ANZ truck. Hence the road upgrade inadvertently increased access to financial services by program participants. Similar public/private partnerships in other areas of Guadalcanal may also prove beneficial.

Appendix 3A – Attempts Made to Source 2006 Village Level Data

The following illustrates the extent to which attempts were made to source 2006 data on the villages investigated as part of this dissertation:

- The 2006 RAMSI survey (RAMSI 2006) and the 2005 Provincial Household Income and Expenditure Survey (Darcy *et al.* 2006) targeted a total of 262 and 570 people in the whole of Guadalcanal in 2006 respectively, so any information collected from these documents will not sufficiently cover a breakdown of the area surveyed.
- The 1999 Solomon Islands census has the most information but even it separates Guadalcanal into various areas and not at village level which is unhelpful for this thesis (Census 1999).
- Attempts were made to gather the 1995/1996 Village Resources Survey data directly from the Solomon Islands Statistics Office, Australian Libraries and authors who have previously referenced such data without success. The fact that the Solomon Islands Statistics Office may not have the available data is not surprising given that an OECD report stated "a January 2003 mission revealed that the National Statistics Office (NSO) was barely functional, having suffered severe losses of resources and records in previous years" due to the civil unrest (OECD 2007).
- The 1970 Solomon Islands survey is dated and substantial population and economic changes would have occurred over the almost 40 year period to 2007.
- ANZ bank was unwilling to provide any private information gathered from treatment villages pre-intervention and in any case, it is uncertain as to whether they would have information related to control villages pre-intervention (which is one year prior to when control villages were offered intervention).
- Attempts were made to gather data from people in the Solomon Islands statistics office and academic researchers.

Note, even if data could have been located from the 1995/1996 survey, it is impossible to conclude (or develop a comfortable degree of certainty) that similarity of control group villages to treatment group villages in 1995/1996 would imply similarity of villages in 2007.

Moreover, there have been significant economic and social changes during the 10 year period. This is largely due to the 1998/1999 civil unrest where militants on the island of Guadalcanal commenced a campaign of intimidation and violence towards Malaitan settlers. During the next year, thousands of Malaitans fled back to Malaita or to the capital, Honiara. One website suggests 20,000 people were forced off Guadalcanal during this period of unrest (Paul and Spirit 1998). This may result in a decrease in the populations of rural villages after 1999.

As explained by DFAT, "violent clashes involving rival militant groups destabilised the Solomon Islands government and undermined national institutions and coherence. This situation persisted for more than four years" (DFAT 1010) and also adversely influenced the economy with GDP contracting by approximately 1.3 percent and 14.3 percent in 1999 and 2000 respectively (IMF 2010). Note also that "the Asian Development Bank estimates that the crash of the market for tropical timber" contributed to the slump in GDP, eliminating "about one-half of all jobs in the timber industry" (US STATE DEPARTMENT 2010). A positive growth rate was only recorded after 2002 (IMF 2010). Hence, any economic characteristics of villages are most likely to have changed during the period from 1995/96 to the time when the survey was undertaken for this thesis.

Further, the Solomon Islands, along with Kiribati and Vanuatu have the largest rate of urban growth among the Pacific Island countries, at over 4 percent per annum between 1995 and 2000 alone (UNFPA 2006). Importantly, in the Solomon Islands, this "urbanization is mostly the result of rural-urban migration" (UNFPA 2006). This may also influence population demographics in surveyed villages.

Finally, according to the IMF, the "data quality" of Solomon Islands Statistics remains weak (IMF 2006), implying the reliability of the 1995/96 survey if it was available would be questionable.

Appendix 3B – Influence of Distance on Dependent Variables

Distance does not appear to influence the majority of dependent variables when considering control and treatment villages separately (refer tables 3.B1 to 3.B2b). The only exceptions are that the average control village client finds it significantly less difficult to pay for clothes for a family member and clothes for a friend by 22.7 percent and 21.9 percent respectively (refer table 3.B1b) the *greater* the distance from the main road. Further, the average treatment village client finds it less difficult to pay for Easter and Christmas related expenses by 12.3 percent and 12.9 percent respectively (refer table 3.B2a) the *greater* the distance from the main road.

Table 3.B1: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Education

OLS

Control Group Respondents

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Distance from the Main Road to the Village ^^	0.090	0.168	-0.049	0.111	0.100	-0.146
	(0.108)	(0.153)	(0.142)	(0.147)	(0.135)	(0.126)
	0.407	*0.276*	*0.732*	*0.451*	*0.460*	*0.248*
Data Used^	196	182	195	196	196	196
Mean Value of Dependent Variable	0.183	0.374	0.337	0.668	0.254	0.227
R^2	0.004	0.007	0.001	0.003	0.003	0.007

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.B1a: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Events

OLS

Control Group Respondents

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Distance from the Main Road to the Village ^^	0.165	0.030	-0.171	0.075
	(0.120)	(0.118)	(0.111)	(0.151)
	0.173	*0.801*	*0.124*	*0.619*
Data Used^	205	210	209	210
Mean Value of Dependent Variable	0.232	0.242	0.211	0.495
R^2	0.009	0.000	0.011	0.001

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.B1b: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes

OLS

Control Group Respondents

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Distance from the Main Road to the Village ^^	-0.052	0.073	0.052	**0.227****	**0.219****
	(0.100)	(0.110)	(0.105)	(0.094)	(0.101)
	0.606	*0.510*	*0.621*	*0.017*	*0.031*
Data Used^	209	210	211	210	204
Mean Value of Dependent Variable	0.883	0.889	0.879	0.897	0.891
R^2	0.001	0.002	0.001	0.027	0.023

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.B2: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Education

OLS

Treatment Group Respondents

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Distance from the Main Road to the Village ^^	-0.025	-0.050	-0.066	0.005	-0.039	0.009
	(0.065)	(0.079)	(0.077)	(0.075)	(0.070)	(0.068)
	0.701	*0.523*	*0.396*	*0.945*	*0.572*	*0.892*
Data Used^	253	243	247	253	253	253
Mean Value of Dependent Variable	0.183	0.374	0.337	0.668	0.254	0.227
R^2	0.001	0.002	0.003	0.000	0.001	0.000

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.B2a: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Events

OLS

Treatment Group Respondents

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Distance from the Main Road to the Village ^^	**0.123***	**0.129***	0.041	0.002
	(0.067)	(0.069)	(0.067)	(0.077)
	0.068	*0.063*	*0.539*	*0.976*
Data Used^	265	261	264	265
Mean Value of Dependent Variable	0.232	0.242	0.211	0.495
R^2	0.013	0.013	0.001	0.000

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Table 3.B2b: Impact of Distance (from the Main Road to Villages) on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes
OLS
Treatment Group Respondents

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Distance from the Main Road to the Village ^^	0.064	0.037	-0.004	0.052	0.024
	(0.048)	(0.040)	(0.047)	(0.044)	(0.045)
	0.183	*0.363*	*0.933*	*0.246*	*0.605*
Data Used^	268	268	268	268	263
Mean Value of Dependent Variable	0.883	0.889	0.879	0.897	0.891
R^2	0.007	0.003	0.000	0.005	0.001

The first row represents the coefficient, the second row (in parentheses) represents the standard error of the independent variable (not corrected for robustness) and the third row (in italics) represent the P-Value. Robust standard errors produce the same reported level of significance as standard errors not corrected for robustness.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

* Significance at the 10 percent level.

** Significance at the 5 percent level.

*** Significance at the 1 percent level.

Appendix 3C – Ordered Probit Analysis

Table 3.C1 - Impact of Intervention on Dependent Variables Relating to Education
Ordered Probit

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Treatment Dummy	**0.355****	**0.306****	**0.366****	-0.001	0.070	0.159
	(0.151)	(0.124)	(0.126)	(0.116)	(0.131)	(0.137)
Number of Children	-0.066	0.087	0.012	0.061	0.100	-0.006
	(0.118)	(0.092)	(0.095)	(0.090)	(0.097)	(0.105)
Number of Children Going to School	0.158	-0.041	-0.046	-0.110	-0.056	-0.172
	(0.126)	(0.101)	(0.103)	(0.098)	(0.106)	(0.116)
Food Consumed '	**0.103****	0.003	0.011	0.008	-0.034	-0.019
	(0.032)	(0.026)	(0.027)	(0.025)	(0.028)	(0.030)
Roof Quality ^^	**0.342****	**0.399****	**0.249****	-0.006	0.105	-0.022
	(0.149)	(0.123)	(0.125)	(0.116)	(0.130)	(0.136)
Wall Quality ^^	0.112	-0.170	-0.006	-0.144	-0.185	0.159
	(0.147)	(0.123)	(0.124)	(0.116)	(0.131)	(0.136)
Number of Bedrooms ^^	-0.270	0.045	0.211	-0.149	-0.055	-0.194
	(0.230)	(0.182)	(0.184)	(0.174)	(0.195)	(0.221)
Interviewee's Age	-0.003	**0.019****	**0.012***	0.000	-0.002	0.003
	(0.009)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Male	-0.021	**-0.345****	-0.231	-0.007	0.048	-0.109
	(0.192)	(0.160)	(0.163)	(0.152)	(0.171)	(0.178)
Interviewee's Education Level ^^^	-0.039	-0.002	-0.046	-0.115	0.042	**0.191***
	(0.108)	(0.087)	(0.088)	(0.084)	(0.094)	(0.100)
Income Change" (self reported)	**0.418****	0.166	**0.364****	**0.366*****	0.147	0.139
	(0.130)	(0.107)	(0.107)	(0.102)	(0.112)	(0.121)
Distance to Village ^^^^	0.080	0.009	-0.126	0.060	-0.014	-0.002
	(0.214)	(0.178)	(0.180)	(0.173)	(0.194)	(0.201)
Data Used^	449	425	442	449	449	449

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error of the independent variable not corrected for robustness. Robust standard errors produce the same level or higher level of significance as standard errors not corrected for robustness.

The ordered values equal 1 if a survey respondent answered 'yes', 2 if a survey respondent answered 'sometimes' and 3 if a survey respondent answered 'no' when asked, in the last 12 months, did household members have any difficulty paying for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

' If any member of the household consumed any of the following items in week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 was recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken a week before the survey was undertaken, a value of 2 was recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

" Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 3.C1a: Impact of Intervention on Dependent Variables Relating to Events
Ordered Probit

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Treatment Dummy	**0.327****	**0.404****	**0.386****	0.111
	(0.131)	(0.130)	(0.134)	(0.117)
Number of Children	**-0.122****	0.003	-0.038	-0.016
	(0.051)	(0.049)	(0.051)	(0.045)
Food Consumed '	0.018	0.027	-0.029	-0.012
	(0.028)	(0.028)	(0.029)	(0.025)
Roof Quality ^^	0.115	0.153	0.019	0.004
	(0.128)	(0.127)	(0.130)	(0.117)
Wall Quality ^^	0.202	**0.294****	0.151	-0.033
	(0.128)	(0.127)	(0.130)	(0.117)
Number of Bedrooms ^^	-0.125	-0.143	0.157	0.059
	(0.217)	(0.208)	(0.198)	(0.183)
Interviewee's Age	0.011	0.003	-0.001	-0.003
	(0.007)	(0.007)	(0.007)	(0.007)
Male	0.001	0.080	0.056	-0.184
	(0.167)	(0.167)	(0.168)	(0.153)
Interviewee's Education Level ^^^	-0.011	-0.093	0.073	-0.134
	(0.092)	(0.090)	(0.094)	(0.085)
Income Change" (self reported)	0.029	0.143	0.083	0.020
	(0.113)	(0.111)	(0.115)	(0.103)
Distance to Village ^^^^	**0.480****	**0.311***	0.077	0.029
	(0.187)	(0.183)	(0.190)	(0.174)
Data Used^	470	471	473	475

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error of the independent variable not corrected for robustness. Robust standard errors produce the same level or higher level of significance as standard errors not corrected for robustness.

The ordered values equal 1 if a survey respondent answered 'yes', 2 if a survey respondent answered 'sometimes' and 3 if a survey respondent answered 'no' when asked, in the last 12 months, did household members have any difficulty paying for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

' If any member of the household consumed any of the following items in week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 was recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken a week before the survey was undertaken, a value of 2 was recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

" Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 3.C1b: Impact of Intervention on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes
Ordered Probit

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Treatment Dummy	-0.060	**0.340****	0.072	-0.047	0.068
	(0.112)	(0.116)	(0.116)	(0.118)	(0.118)
Food Consumed '	0.017	0.003	0.006	0.012	0.001
	(0.024)	(0.025)	(0.025)	(0.026)	(0.026)
Roof Quality ^^	**0.216***	**0.209***	-0.051	0.038	-0.076
	(0.113)	(0.115)	(0.116)	(0.118)	(0.118)
Wall Quality ^^	0.000	0.097	0.146	0.055	0.027
	(0.113)	(0.115)	(0.116)	(0.119)	(0.119)
Number of Bedrooms ^^	-0.214	-0.213	-0.140	-0.226	-0.210
	(0.169)	(0.170)	(0.172)	(0.174)	(0.174)
Interviewee's Age	0.005	-0.006	-0.003	-0.010	-0.003
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Male	0.218	0.183	0.206	0.230	0.213
	(0.147)	(0.150)	(0.151)	(0.155)	(0.155)
Interviewee's Education Level ^^^	-0.038	-0.066	0.022	0.052	0.133
	(0.080)	(0.082)	(0.083)	(0.084)	(0.085)
Income Change" (self reported)	0.000	-0.062	-0.159	-0.164	-0.131
	(0.097)	(0.098)	(0.100)	(0.102)	(0.102)
Distance to Village ^^^^	0.099	0.173	-0.074	0.177	0.087
	(0.168)	(0.171)	(0.173)	(0.176)	(0.176)
Data Used^	477	478	479	478	467

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error of the independent variable not corrected for robustness. Robust standard errors produce the same level or higher level of significance as standard errors not corrected for robustness.

The ordered values equal 1 if a survey respondent answered 'yes', 2 if a survey respondent answered 'sometimes' and 3 if a survey respondent answered 'no' when asked, in the last 12 months, did household members have any difficulty paying for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

' If any member of the household consumed any of the following items in week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 was recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken a week before the survey was undertaken, a value of 2 was recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

" Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Appendix 3D – Impact of Intervention (including people who answered no)

The following considers impact of intervention assuming all people who said no had 100% difficulty when asked "did the household had purchased an item in the last 12 months"

Table 3.D1 - Impact of Intervention on Dependent Variables Relating to Education
OLS
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for					
	School Fees	School Shoes	School Books	School Clothes	Stationary	Children's pocket money
Treatment Dummy	**0.077***	0.051	**0.119****	-0.0110	0.0160	0.043
	(0.039)	(0.036)	(0.039)	(0.035)	(0.036)	(0.033)
Number of Children	-0.014	0.035	-0.004	0.013	0.031	-0.001
	(0.023)	(0.031)	(0.030)	(0.034)	(0.030)	(0.017)
Number of Children Going to School	0.039	-0.007	-0.004	-0.029	-0.016	**-0.049****
	(0.029)	(0.039)	(0.038)	(0.049)	(0.045)	(0.023)
Food Consumed "	**0.025*****	-0.001	0.004	0.007	-0.009	-0.006
	(0.006)	(0.010)	(0.009)	(0.009)	(0.010)	(0.005)
Roof Quality ^^	**0.083***	**0.155****	**0.074**	0.032	0.035	-0.005
	(0.040)	(0.071)	(0.064)	(0.055)	(0.047)	(0.043)
Wall Quality ^^	0.022	-0.045	0.003	-0.030	-0.052	0.048
	(0.038)	(0.066)	(0.055)	(0.051)	(0.046)	(0.033)
Number of Bedrooms ^^	-0.069	0.042	0.092	-0.054	-0.009	-0.050
	(0.045)	(0.058)	(0.080)	(0.051)	(0.071)	(0.050)
Interviewee's Age	-0.001	**0.008****	**0.005****	0.000	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Male	0.008	**0.165****	0.101	-0.009	-0.008	0.032
	(0.054)	(0.054)	(0.073)	(0.072)	(0.053)	(0.047)
Interviewee's Education Level ^^^	-0.010	-0.014	-0.020	-0.052	0.010	**0.056****
	(0.026)	(0.034)	(0.028)	(0.031)	(0.031)	(0.017)
Income Change"' (self reported)	**0.102****	**0.062***	**0.138****	**0.132****	0.044	0.039
	(0.026)	(0.034)	(0.038)	(0.041)	(0.041)	(0.031)
Distance to Village ^^^^	0.013	-0.003	-0.036	0.024	-0.002	-0.005
	(0.055)	(0.070)	(0.062)	(0.048)	(0.055)	(0.049)
Data Used^	449	449	449	449	449	449
Mean Value of Dependent Variable	0.183	0.408	0.347	0.668	0.254	0.227
Adjusted R^2	0.053	0.034	0.034	0.011	0.016	0.040

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 3.D2: Impact of Intervention on Dependent Variables Relating to Events
OLS
All Survey Respondents

	Dependent variables: Did not experience difficulty paying for			
	Easter related expenses	Christmas related expenses	Birthday related expenses	Church related expenses
Treatment Dummy	0.044	0.106**	0.090*	0.041
	(0.046)	(0.032)	(0.048)	(0.043)
Number of Children	-0.025*	0.002	0.002	-0.007
	(0.012)	(0.009)	(0.015)	(0.019)
Food Consumed "	-0.001	0.007	-0.011	-0.005
	(0.012)	(0.007)	(0.007)	(0.009)
Roof Quality ^^	0.043	0.032	0.018	-0.004
	(0.029)	(0.034)	(0.028)	(0.038)
Wall Quality ^^	0.066	0.112**	0.064	-0.016
	(0.039)	(0.041)	(0.039)	(0.061)
Number of Bedrooms ^^	-0.023	-0.043	0.025	0.027
	(0.064)	(0.071)	(0.064)	(0.084)
Interviewee's Age	0.002	0.00	0.00	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)
Male	-0.037	-0.042	0.002	0.08
	(0.052)	(0.048)	(0.046)	(0.054)
Interviewee's Education Level ^^^	-0.007	-0.027	0.014	-0.048*
	(0.022)	(0.026)	(0.017)	(0.025)
Income Change"' (self reported)	0.006	0.028	0.022	0.01
	(0.031)	(0.029)	(0.021)	-0.03
Distance to Village ^^^^	0.138**	0.121**	0.012	0.00
	(0.049)	(0.049)	(0.054)	(0.052)
Data Used^	481	481	481	481
Mean Value of Dependent Variable	0.249	0.258	0.225	0.501
Adjusted R^2	0.014	0.028	-0.002	-0.011

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it more difficult to pay for a particular item. Hence, an independent variable with a positive coefficient implies that the average household finds it less difficult to pay for a particular item.

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"' Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 3.D3: Impact of Intervention on Dependent Variables Relating to Kitchen Utensils, Tools and Clothes

OLS

All Survey Respondents

	Dependent variables: Did not experience difficulty paying for				
	Kitchen utensils	Tools used to harvest and sell produce	Clothes for the survey respondent	Clothes for family member	Clothes for a friend
Treatment Dummy	0.014	0.083**	0.04	0.019	0.029
	(0.021)	(0.024)	(0.022)	(0.026)	(0.029)
Food Consumed "	-0.002	-0.001	-0.005	0.002	-0.001
	(0.007)	(0.007)	(0.005)	(0.005)	(0.007)
Roof Quality ^^	0.053	0.056*	-0.005	0.014	0.006
	(0.033)	(0.029)	(0.032)	(0.020)	(0.033)
Wall Quality ^^	-0.01	0.00	0.038	0.002	0.004
	(0.030)	(0.034)	(0.034)	(0.028)	(0.038)
Number of Bedrooms ^^	0.007	-0.023	0.007	-0.038	-0.014
	(0.045)	(0.037)	(0.048)	(0.041)	(0.046)
Interviewee's Age	0.001	-0.002	-0.001	-0.001	0.00
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Male	-0.011	-0.007	-0.01	0.019	0.04
	(0.033)	(0.034)	(0.041)	(0.034)	(0.036)
Interviewee's Education Level ^^^	-0.017	-0.018	-0.023	-0.016	-0.002
	(0.021)	(0.021)	(0.016)	(0.019)	(0.016)
Income Change"' (self reported)	0.009	-0.004	-0.027	-0.026	0
	(0.023)	(0.018)	(0.034)	(0.030)	(0.028)
Distance to Village ^^^^	0.045	0.047	0.004	0.086*	0.07
	(0.026)	(0.030)	(0.042)	(0.044)	(0.049)
Data Used^	481	481	481	481	481
Mean Value of Dependent Variable	0.884	0.890	0.879	0.898	0.894
Adjusted R^2	-0.008	0.010	-0.008	-0.001	-0.010

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at the village level.

The dependent variable equals 1 if a household finds it less difficult to pay for a particular item and 0 if the household finds it

^ As some households did not spend money on certain items, the data used varies between the dependent variables.

^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence denoted 0, 1 and 2 respectively in the data set.

^^^^ Orders villages, in kilometres, from the village closest to the main road, to the village furtherest away from the main road. Refer section 3.2 for further details.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

"" Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income are denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

* Significance at the 10 percent level, ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Chapter 4 – Impact of Time Preferences on an Individual's Decision to Maintain an Open Savings Account

4.0 Introduction

Have you ever postponed saving for a car or holiday or left credit card repayments to a later date? Assuming you have a fixed monthly disposable income, this would imply discretionary expenditure would be greater now than it would be later. In other words, you have more money in the immediate future to go out for a special dinner, watch that play and buy some good clothes. Saving for credit card repayments can be done later. This phenomenon, where we are impatient now (in regards to spending money) and patient later is defined as present-biased time inconsistency[64]. But what happens when later comes? Some of us would still want to go out for nice dinners, further postponing planned savings. Under these circumstances, the decisions made by our *future selves* are inconsistent with those made by us in the *present.* This does not represent an optimal level of welfare.

To rectify this situation, an option is to engage in a commitment savings device that may encourage savings by penalising us for not continuously saving (by charging a fee) and/or reward us for continuously saving (by issuing a higher interest rate). Now consider the case in a developing country where there is little or no access to formal commitment savings facilities. A household head in a village may like to save for an unforeseen medical emergency and for birthday presents however they may also have the immediate desire to spend money on alcohol. In such instances, if the household head is sophisticated enough to understand their own self-control problems (i.e. that they are present-biased time inconsistent) but does not have access to a commitment savings device, they may spend excess money in the near-term thus reducing the amount available for important and unexpected long-term expenditure. If such occurrences are widespread, then expanding access to commitment savings facilities in developing countries may improve welfare by encouraging continuous savings and hence reducing time inconsistent behaviour.

[64] Present-biased time inconsistency is not confined to monetary examples (see for example O'Donoghue and Rabin 1999).

This study focuses on a particular region in a developing country. It is designed to fill a void in literature by asking: "Do time preferences impact on an individual's decision to maintain an open savings account?" The hypothesis is that an individual's present-biased or future-biased time-inconsistent preferences, which highlight their commitment problems, impact on their decision to maintain an open savings account. Note this study does not focus on savings levels.

A recent study by Ashraf *et al.* (2006) most closely resembles the investigation undertaken in this study. However while it focuses on whether *existing* savers with present-biased time preferences engage in commitment savings facilities this study considers whether *people* with present-biased time preferences maintain open savings accounts. Further, Ashraf *et al.* (2006) only paint part of the picture; this study also adds to literature by being the first to consider the impact of future-biased time inconsistent preferences and time consistent preferences on maintaining an open savings account[65]. This additional focus is important given the steady increase in literature presenting examples of situations where future-biased time inconsistency is more prevalent than present-biased time inconsistency (Sayman and Onculer 2007; Takeuchi 2008; Attema, Bleichrodt, Rohde and Wakker 2009).

A natural field study in collaboration with ANZ bank in the Solomon Islands was undertaken to investigate the research question. Independent of ANZ bank, hypothetical time preference questions were administered to 268 rural ANZ 'clients' and 231 rural 'non clients' from the same 11 villages who were offered rural banking savings accounts between January 2006 and mid-March 2006[66]. Only the 'clients' accepted savings facilities when offered. The survey was undertaken from mid-April 2007 to mid-May 2007 implying ANZ clients have maintained open savings accounts for just over one year.

Results show present-biased time preferences significantly impact on the average survey respondent's decision to maintain an open savings account by approximately 13 percent. Results also indicate future-biased time preferences significantly impact on the average survey respondent's decision to maintain an open savings account by approximately 34

[65] Future-biased time consistent preferences refer to instances where a person is patient now and impatient later. Time consistency refers to instances where a person has the same level of patience now and in the future. Refer chapter 2 section 2.1.2 for a more detailed definition.
[66] The rural banking savings account is a commitment savings account.

percent. This study provides the first field evidence that time-inconsistent preferences influences a person's decision to maintain an open formal savings facility.

Additionally, the summary statistics demonstrate, on average, clients answer hypothetical time preference questions with present-bias. However when answers are categorised into (impatiently and patiently) time consistent and (present-biased and future-biased) time inconsistent, results overwhelmingly indicate clients answer questions time consistently. Data analysed from studies by Ashraf *et al.* (2006) and Meier and Sprenger (2008a) demonstrate a similar pattern. That most people demonstrate time consistency is important when considering results of this study also show time-consistent preferences significantly impact on the average survey respondent's decision *not* to maintain an open formal savings facility by approximately 18 percent. Critically, such findings contradict literature that suggests the "assumption of time consistency is importantly wrong" (O'Donoghue and Rabin 1999:303).

This chapter is structured as follows. Section 4.1 explains the evaluation design while section 4.2 highlights the determinants of time preference and section 4.3 discusses the summary statistics. Section 4.4 describes the model used to assess impact. Section 4.5 examines the results of the study, section 4.6 considers some limitations and section 4.7 concludes.

4.1 Evaluation Design

The following section explains the evaluation design used in this study. The data used was gathered through an independent survey of 268 ANZ clients and 231 non-clients in 11 villages from mid-April 2007 to mid-May 2007 (time 2). Clients represent people who opened formal savings facilities when initially offered between January 2006 and mid-March 2006 (time 1), while non-clients represent people who refused to open formal savings facilities during this same period. Hence during the period between time 1 and time 2, clients remained clients and non-clients remained non-clients. As the survey was undertaken at time 2 and clients opened savings accounts at time 1, comparing characteristics of clients to non-clients should reveal those that suggest why people maintained an open savings account for approximately a year.

The 11 villages used in the study are located in the same region in Guadalcanal and were selected for two main reasons. Firstly, none of the villages were offered formal savings by another institution, hence reducing possible substitution bias. Secondly, selecting these villages was cost effective as they represent the same 'treatment' villages surveyed for the study undertaken in chapter 3[67].

To select clients and non-clients, enumerators visited every household in the village. As multiple people in a client household may hold a savings account, enumerators followed a survey sequence where they interviewed the eldest male account holder. If a male account holder was unavailable, a female savings account holder was interviewed. As in chapter 3, in both client and non-client households, there was a bias towards obtaining male responses over female responses as males are considered to have the most household power in the Solomon Islands (Scales 2003).

To ensure groups were comparable, people in non-client households were surveyed using a similar sequence. First the enumerator interviewed the eldest male in the household and if a male was unavailable, a female in the household was interviewed. The sex and age of the survey respondents is statistically similar between the average client and non-client (refer summary statistics section 4.3).

Importantly, as the survey is undertaken at time 2 and not at take-up at time 1, the analysis focuses on whether time preferences impact on *maintaining* an open savings account as opposed to whether time preferences influence savings take-up. Moreover, it is possible time preferences of clients at time 2 have changed from time 1 due to their access to savings facilities between times 1 and 2. Nevertheless, Ashraf *et al.* (2008) show that access to a commitment savings device has no significant affect on the average person's perception of self-control (i.e. patience) one year after initial intervention. Their study appears to be the only paper that investigates this relationship.

Unlike the study in chapter 3, this study does not suffer from non-random program placement as all people in the village were eligible for program participation. Further,

[67] Hence the background information on the Solomon Islands and the community surveyed in chapter 3 is applicable to this study.

selection bias is mitigated as clients self-selected into the program while non-clients did not.

4.2 Determinants of Time Preference

The following section highlights the approach used to estimate time preference.

Frederick and Loewenstein (2002) claim 'choice tasks' are the most common method of asking hypothetical time preference questions in experiments. He explains in "a typical choice task, subjects are asked to choose between a smaller, more immediate reward and a larger, more delayed reward" (Frederick and Loewenstein 2002:47).

Three different hypothetical time preference 'choice' questions were asked to all survey respondents. Borrowing a phrase from Ashraf *et al.* (2006:647), more than one question was asked "to test whether the context of these questions influences the prevalence and predictive power of hyperbolic preferences"[68]. Table 4.1 reveals the questions asked during the survey.

Table 4.1: Hypothetical Time Preference Questions

Group 'N'	Question	Answer	
		Immediate (Impatient)	Delayed (Patient)
1	1a) Would you prefer $400 now or $500 in one month's time?	now	1 month
	1b) Would you prefer $400 in six months or $500 in seven months time?	6 months	7 months
2	2a) Would you prefer two pigs now or three pigs in one month's time?	now	1 month
	2b) Would you prefer two pigs in six months or three pigs in seven month's time?	6 months	7 months
3	3a) Would you prefer a bag of rice now or two bags of rice in one month's time?	now	1 month
	3b) Would you prefer a bag of rice in six month's time or two bags of rice in seven month's time?	6 months	7 months

In table 4.1 there are 3 different groups. Each group is broken down into the 'near-term question' 'Na' and the 'distant-term question' 'Nb' where N = 1, 2 or 3[69]. For each near-

[68] Hyperbolic preferences are the same as present-biased time preferences.

[69] The survey was undertaken between mid-April and mid-May which implies that, at the latest, the 6 to 7 month period refers to mid-November to mid-December. There is the possibility that people who answered the survey in mid-May will want more money in 7 months as Christmas is approaching. Conversely, people may want more money immediately as Easter has just concluded and they may be short of cash. It is assumed any seasonality effects will be on average similar across both treatment and control group members. If this is

term and distant-term question, there is the option of choosing an immediate reward or a delayed reward. If a person chooses the immediate reward they are considered impatient; if they chose the delayed reward they are considered patient. For any 'N' group, answers can be patiently or impatiently time consistent or can be present-biased or future-biased time inconsistent. These options are illustrated in table 4.2.

Table 4.2 - Matrix Outlining Time Preferences

		Distant Term Question Nb^	
		Immediate reward selected	**Delayed reward selected**
Near Term Question Na^	**Immediate reward selected**	impatiently time consistent	present-biased time inconsistency
	Delayed reward selected	future-biased time inconsistency	patiently time consistent

^ N = 1, 2 or 3

Questions in group 1 are monetary goods questions. The amounts of 400 and 500 Solomon Dollars were selected as they represent very good fortnightly wages for villagers.

Questions in group 2 are luxury goods questions as eating pork is not undertaken regularly in the Solomon Islands. Indeed, information gathered during the survey process demonstrates that only 7.36 percent and 8.96 percent of people in non-client and client households respectively, consumed pork one week prior to the survey. This implies that the killing and consumption of pigs is likely to be rare. Hence, the distant reward of three pigs is likely to represent a strong enough incentive for some people to demonstrate patience.

Questions in group 3 relate to normal goods as rice is a staple eaten by many people in the Solomon Islands[70]. Hence answers to this question provide a contrast to the luxury goods question and the monetary question.

not the case, then results may be upwardly or downwardly biased. Note that other peer reviewed papers have also not considered this distinction (see for example Ashraf 2006)

[70] A bag of rice refers to a 5kg bag of rice which was valued at approximately 38 Solomon Dollars at the time of the survey.

4.3 Summary Statistics

The following section considers the demographic characteristics of survey respondents. It also analyses answers to hypothetical time preferences questions and compares data gathered in this study with those in literature.

4.3.1 Demographic Characteristics

As illustrated in tables 4.3 and 4.3A, demographic characteristics are largely similar across clients and non-clients. For instance, the average age of the survey respondents is approximately 37 years, the percentage of male respondents is approximately 57 percent and the average age of the household head is approximately 45 years. Approximately 94 percent of households have 1 or more children and over 92 percent of households have at least 1 child enrolled at school.

There are some noticeable differences in characteristics between client and non-client households. To illustrate, 91 percent of client households have more than one working adult while this number is slightly lower at 85 percent for non-client households[71]. Additionally, the level of education of both the household head and the survey respondent is higher among client households relative to non-client households. Almost 78 percent of household heads in client households were enrolled in primary school while this number drops to 72 percent in non-client households. Further, 22 percent of household heads in client households had no education compared to 28 percent in non-client households. In relation to survey respondents, 47 percent of those in client households have been enrolled in secondary school or higher while this number drops to 35 percent for non-client households.

As was the case in chapter 3, due to the survey approach undertaken, females are on average 29 years old, males are on average 42 years old and these younger females have a higher level of education than older males at a 5 percent level of significance (refer table 4.3B). Further, male survey respondents live in 'wealthier' households as demonstrated by

[71] Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

higher value roofs at a 10 percent level of significance. There are no other significant differences between males and female survey respondents.

Refer tables 4.3, 4.3A and 4.3B for further summary statistics. The data was gathered over the same observable characteristics as those used in chapter 3.

Table 4.3: Balance Test between Clients and Non-Clients
Household Level Demographic Characteristics
Sample Frame: Clients (268), Non-Clients (231)
T-test

	Clients		Non-Clients		Balance Test		Comment***	Data used****
	Mean	S.E.	Mean	S.E.	T-Test	P-Value		
Demographic Characteristics								
People over 55	0.55	(0.70)	0.47	(0.60)	1.37	0.17	People over 55 years of age = 0,1,>1	0,1,2
Was the interviewee the household head?	0.50	(0.50)	0.51	(0.50)	0.23	0.82	Yes, no	1, 0
Age of household head	44.23	(8.73)	44.74	(8.81)	0.66	0.51		
Education of household head	1.04	(0.74)	0.90	(0.67)	**2.21****	0.03	Primary, secondary, tertiary^	1,2,3
Number of people living in household	6.04	(1.56)	5.98	(1.58)	0.44	0.66		
Number of working adults in household^^	2.56	(0.99)	2.48	(1.00)	0.84	0.40		
Number of children	2.82	(1.38)	2.76	(1.36)	0.49	0.63		
Number of children going to school	2.45	(1.25)	2.35	(1.27)	0.82	0.41		
Dependency ratio	0.44	(0.17)	0.42	(0.15)	1.14	0.26	No. of working adults/no.of people in household	
Children/Workers	1.33	(0.98)	1.34	(0.98)	0.17	0.86		
Number of people who don't work and don't go	1.03	(0.84)	1.14	(0.92)	1.43	0.15		
Age of interviewee	36.94	(11.03)	36.23	(11.08)	0.71	0.48		
Sex of interviewee	0.56	(0.50)	0.58	(0.50)	0.44	0.66	Male, female	1, 0
Education of interviewee	1.33	(0.75)	1.21	(0.67)	**1.87****	0.06	Primary, secondary, tertiary^	1,2,3
Household quality								
Walls	0.43	(0.50)	0.45	(0.50)	0.29	0.77	Sago Palms, Timber	0,1
Roof	0.49	(0.50)	0.47	(0.50)	0.56	0.58	Sago Palms or Timber, Copper^^^^	0,1
Number of bedrooms	1.11	(0.32)	1.09	(0.29)	0.77	0.44	1, 2, 3 bedrooms or >3 bedrooms	1,2
Food quality '	12.32	(2.13)	11.82	(2.64)	**2.37****	0.02		
Income change^^^ (self reported)	1.17	(0.57)	1.05	(0.53)	**2.44****	0.02	Decrease, no change, increase	0,1,2

* Significance at the 10 percent level.

** Significance at the 5 percent level.

^ Years of primary school, secondary school and tertiary school attendence are assumed to be 5, 10 and 15 years respectively.

^^ Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income is denoted as 0, 1 and 2 respectively in the data set. An increase, decrease or no-change in income was self-reported by the survey respondent.

^^^^ Households that had roofs made from Sago Palms or Timber were combined in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

*** Comment refers to a comment made on the corresponding independent variable in the table.

**** "Data used" corresponds to the information in the comments section.

Table 4.3A: Summary Statistics
Detailed Household Level Demographic Characteristics
Sample Frame: Client Households (268), Non-Client Households (213)

	Clients						Non-clients					
Number of people over 55 (percentage)	**0** 55.22%	**1** 36.94%	**>1** 7.84%				**0** 58.87%	**1** 35.50%	**>1** 5.63%			
Was the interviewee the household head? (percentage)	**Yes** 49.63%	**No** 50.37%					**Yes** 50.65%	**No** 49.35%				
Age of household head (years)	44						45					
What education has the household head received?^ (percentage)	**None** 22.39%	**Primary** 77.61%	**Secondary (or higher)** 26.49%				**None** 27.71%	**Primary** 72.29%	**Secondary (or higher)** 17.75%			
Number of people living in household (percentage)	**<4** 4.85%	**4** 10.45%	**5** 20.15%	**6** 24.63%	**7** 23.51%	**>7** 16.42%	**<4** 6.93%	**4** 9.96%	**5** 20.78%	**6** 25.54%	**7** 20.35%	**>7** 16.45%
Number of working adults in household (percentage)	**1** 9.33%	**2** 45.90%	**3** 30.22%	**>3** 14.55%			**1** 14.72%	**2** 41.56%	**3** 27.71%	**>3** 16.02%		
Number of children (percentage)	**0** 5.60%	**1** 7.84%	**2** 29.10%	**3** 29.10%	**4** 17.16%	**≥5** 11.19%	**0** 4.76%	**1** 12.55%	**2** 25.97%	**3** 27.27%	**4** 19.05%	**≥5** 9.96%
Number of children going to school (percentage)	**0** 5.60%	**1** 14.18%	**2** 36.19%	**3** 24.25%	**≥4** 19.78%		**0** 7.36%	**1** 18.61%	**2** 29.00%	**3** 25.97%	**≥4** 19.05%	**≥5**
Age of survey respondent	37						36					
Sex of survey respondent	**Male** 55.60%	**Female** 44.40%					**Male** 57.58%	**Female** 42.42%				
What education has the survey respondent received?^	**None** 13.43%	**Primary** 86.57%	**Secondary (or higher)** 46.64%				**None** 13.85%	**Primary** 86.15%	**Secondary (or higher)** 35.06%			
Has household income decreased (o), experienced no change (1) or increased (2) in the 12 months prior to the evaluation relative to the period between 24 months and 12 months prior to the evaluation?	**0** 8.96%	**1** 65.30%	**2** 25.75%				**0** 11.69%	**1** 71.86%	**2** 16.45%			

^ Education refers to enrolment in a particular level of schooling.

Table 4.3B: Balance Test between Females and Males
Household Level Demographic Characteristics
Sample Frame: Females (217), Males (282)
T-test

	Females		Males		Balance Test		Comment***	Data used****
	Mean	S.E.	Mean	S.E.	T-Test	P-Value		
Demographic Characteristics								
People over 55	0.51	-0.68	0.51	-0.64	0.12	0.90	People over 55 years of age = 0,1,>1	0,1,2
Age of household head	44.85	-8.48	44.17	-8.98	0.86	0.39		
Education of household head	0.95	-0.66	1.00	-0.75	0.73	0.46	Primary, secondary, tertiary^	1,2,3
Number of people living in household	6.04	-1.45	5.99	-1.66	0.37	0.71		
Number of working adults in household^^	2.52	-0.94	2.52	-1.04	0.01	1.00		
Number of children	2.82	-1.33	2.77	-1.39	0.37	0.71		
Number of children going to school	2.43	-1.25	2.38	-1.27	0.44	0.66		
Dependency ratio	0.43	-0.16	0.43	-0.16	0.05	0.96	No. of working adults/no.of people in household	
Children/Workers	1.33	-0.96	1.34	-1.00	0.06	0.95		
Number of people who don't work and don't go	1.09	-0.81	1.08	-0.94	0.12	0.90		
Age of interviewee	29.44	-7.63	42.13	-10.06	**15.46****	0.00		
Education of interviewee	1.55	-0.56	1.07	-0.75	**7.87****	0.00	Primary, secondary, tertiary^	1,2,3
Household quality								
Walls	0.45	-0.50	0.43	-0.50	0.50	0.62	Sago Palms, Timber	0,1
Roof	0.44	-0.50	0.51	-0.50	**1.69***	0.09	Sago Palms or Timber, Copper^^^^	0,1
Number of bedrooms	1.11	-0.31	1.10	-0.30	0.24	0.81	1, 2, 3 bedrooms or >3 bedrooms	1,2
Food quality '	12.13	-2.46	12.06	-2.34	0.32	0.75		
Income change^^^ (self reported)	1.09	-0.54	1.13	-0.56	0.71	0.48	Decrease, no change, Increase	0,1,2

* Significance at the 10 percent level.

** Significance at the 5 percent level.

^ Years of primary school, secondary school and tertiary school attendence are assumed to be 5, 10 and 15 years respectively.

^^ Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Refers to whether household income has increased in the 12 months prior to the survey relative to the period between 24 months to 12 months prior to the survey. A decrease, no-change and increase in household income is denoted as 0, 1 and 2 respectively in the data set.

^^^^ Households that had roofs made from Sago Palms or Timber are combined in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

*** Comment refers to a comment made on the corresponding independent variable in the table.

**** "Data used" corresponds to the information in the comments section.

4.3.2 Analysis of Time Preference

The following sub-section illustrates and analyses answers to hypothetical time preference questions. Comparisons with literature are also undertaken.

For non-clients, a simple t-test is used to estimate time preference by comparing answers to the near term question 'Na', to answers of the distant term question 'Nb', for all N. Results in column J of table 4.4 demonstrates that there is no significant difference between the answer to question 2a and 2b as well as between the answer to question 3a and 3b. Hence across the majority of questions (i.e. questions in groups 2 and 3), the average non-client is time consistent.

Table 4.4 - Estimation of Time Preference Using Answers to Hypothetical Time Preference Questions among Non-Clients

Sample Size: 231

T-Test

	Answers to Near Term Questions (Na)			Answers to Distant Term Questions (Nb)			Difference^		
A	B	C	D	E	F	G	H	I	J
Question N	Patiently	Impatiently	S.E.	Patiently	Impatiently	S.E.	Percentage	T-Statistic	P-Value
Question 1	46%	54%	0.499	55%	45%	0.499	9%	**1.864***	0.063
Question 2	43%	57%	0.497	48%	52%	0.501	5%	1.119	0.264
Question 3	48%	52%	0.501	55%	45%	0.499	7%	1.489	0.137
Average	**46%**	**54%**		**53%**	**47%**		**7%**		

** Significance at the 5 percent level

* Significance at the 10 percent level

^ The difference determines if the answer to the near term question is statistically different to the distant term question. Hence the percentage of people answered patiently in the near term (column B) are subtracted from the percentage of people answered patiently in the distant term (column C) when calculating the t-statistic.

If a respondent answers impatiently (it equals 1 in the data set) and if a respondent answers patiently (it equals 0 in the data set)

For clients, results in column J of table 4.4a demonstrates that there *is* a significant difference between the answer to question 1a and 1b as well as between the answer to question 2a and 2b. Hence across the majority of questions (i.e. questions in groups 1 and 2), the average client is present-biased time inconsistent.

Table 4.4a - Estimation of Time Preference Using Answers to Hypothetical Time Preference Questions among Clients

Sample Size: 268

T-Test

	Answers to Near Term Questions (Na)			Answers to Distant Term Questions (Nb)			Difference		
A	B	C	D	E	F	G	H	I	J
Question N	Patiently	Impatiently	S.E.	Patiently	Impatiently	S.E.	Percentage	T-Statistic	P-Value
Question 1	54%	46%	(0.499)	65%	35%	(0.479)	10%	**2.384****	0.018
Question 2	52%	48%	(0.500)	62%	38%	(0.486)	10%	**2.276****	0.023
Question 3	51%	49%	(0.501)	53%	47%	(0.500)	1%	0.259	0.796
Average	**53%**	**47%**		**60%**	**40%**		**7%**		

** Significance at the 5 percent level

* Significance at the 10 percent level

^ The difference determines if the answer to the near term question is statistically different to the distant term question. Hence the percentage of people answered patiently in the near term (column B) are subtracted from the percentage of people answered patiently in the distant term (column C) when calculating the t-statistic.

If a respondent answers impatiently (it equals 1 in the data set) and if a respondent answers patiently (it equals 0 in the data set)

Nevertheless, when categorising this client data according to the four different options for time preferences, results in table 4.5[72] reveal the majority of clients exhibit time consistency.

Table 4.5 - Answers to Hypothetical Questions Categorised According to Time Preference for Clients

Sample Size: 268

A	B	C	D	E	F
	Patient now, Patient later (patiently time consistent)	Impatient now, Impatient later (impatiently time consistent)	Impatient now, patient later (present-biased time inconsistent)	Patient now, Impatient later (future-biased time inconsistent)	Total
Question 1	47%	28%	18%	7%	100%
Question 2	46%	32%	16%	6%	100%
Question 3	44%	40%	9%	8%	100%
Average	46%	33%	14%	7%	100%

Table 4.5 shows on average, across question groups 1, 2 and 3, 46 percent of all clients answered questions with patient time consistency (refer column B) and approximately 33 percent of all clients answered questions with impatient time consistency (refer column C). Hence approximately 79 percent of clients answer questions with time consistency.

[72] When comparing table 4.5 to a similar table for non-clients, highlighted in table 4.A1 (Appendix 4A), the results show that the largest difference between clients and non-clients are that non-clients are more consistently impatient than clients. Intuitively, this is reasonable; people who are more consistent with their time preferences have more self-control and are hence less likely to require commitment devices.

Conversely fewer clients demonstrate time inconsistency when answering hypothetical time preference questions. Table 4.5 shows on average, across question groups 1, 2 and 3, 14 percent of clients answered questions with present-biased time inconsistency (column D) while 7 percent of clients answered questions with future-biased time inconsistency (column E). Thus, only approximately 21 percent of clients answered questions with time inconsistency.

Current literature largely focuses on the importance of time inconsistency, and in particular, present biased time inconsistency, on individual behaviour (Frederick and Loewenstein 2002). However, given the ratio of time consistency to time inconsistency of 79:21 in table 4.5, the summary statistics of this study suggest there should be a greater focus on time consistent preferences.

To investigate this divergence from literature it is interesting to analyse results from the survey of 1777 existing or former savings clients by Ashraf *et al.* (2006). Their results indicate 25.7 percent of all people demonstrated hyperbolic characteristics while 14.6 percent demonstrate future-biased inconsistency[73]. This equates to approximately 60 percent of people who demonstrate time consistency. Hence these results alone suggest the majority of people already demonstrate time consistency.

Additionally if the approach taken in this chapter was replicated by Ashraf *et al.* (2006), their results are likely to suggest even more people demonstrate time consistency than time inconsistency. Specifically, this study's approach involved asking a person to answer either 'patiently' or 'impatiently'. Conversely Ashraf *et al.* (2006) allow people to answer either 'patiently', 'impatiently' or 'somewhat impatiently'. To compare results from this study to those of Ashraf *et al.* (2006), answers people have given to 'somewhat impatiently' were eliminated and reallocated evenly as if those people only had a choice between answering 'patiently' and 'impatiently'. Thus it is assumed 50 percent of the people who answered 'somewhat patiently' would answer 'patiently' while the remaining 50 percent would answer 'impatiently'. Admittedly this approach provides only an estimate and is unlikely to convey actual answers.

[73] These figures were calculated from Ahraf *et al.* (2006:648).

With these modifications, results from Ashraf *et al.* (2006) would be similar to results from this study. Further, the data from a more recent study by Meier and Sprenger (2008a) provide similar findings with 25 percent of credit card borrowers demonstrating present-bias and 2 percent demonstrating future-bias, implying an overwhelming 73 percent of borrowers demonstrate time-consistency. Results from this study, the study by Meier and Sprenger (2008a) and non-modified and modified figures from Ashraf *et al.* (2006) are illustrated in table 4.6.

Table 4.6 - Comparison of Answers to Hypothetical Time Preference Questions with Literature

	This study	Ashraf et al (2006) modified results	Difference	Meier and Sprenger (2008a)	Ashraf et al (2006) original results
Time Consistency					
Patiently Time Consistent	46%	47%	1%	N/A	34%
Impatiently Time Consistent	33%	27%	-6%	N/A	17%
Somewhat Impatiently Time Consistent	N/A	N/A	N/A	N/A	8%
Time Consistent	**79%**	**74%**	-5%	**73%**	**60%**
Time Inconsistency					
Present-Biased Time Inconsistent	14%	17%	3%	25%	26%
Future-Biased Time Inconsistency	7%	9%	2%	2%	15%
Time Inconsistent	**21%**	**26%**	5%	**27%**	**40%**
Total	**100%**	**100%**		**100%**	**100%**

All three studies suggest answers to hypothetical time preferences questions generate responses that are generally time consistent and not hyperbolic.

Why this divergence from literature? A potential reason is that models demonstrating present-bias correlation with a particular action do not necessarily suggest that the number of people with present-biased time preferences is particularly high. For instance, that Shui and Ausubel (2004) find evidence of hyperbolic discounting in people with high levels of credit-card debt is not surprising; by definition an impatient person takes out a larger amount of credit as they are *impatient* for cash. However it does not necessarily imply that most of the people investigated demonstrate present-biased time preferences. Hence, while time-inconsistency may be suggestive of certain actions, literature should also consider investigating influences of time consistency in greater detail.

4.4 Model

The following model is used to test whether present-biased or future-biased time-inconsistent preferences impact on an individual's decision to maintain an open savings account.

$$D_i = c_1 + \gamma_1 x_{1i} + \gamma_2 x_{2i} + \gamma_3 x_{3i} + \mu_{1i} \qquad \text{Eq 4.1}$$

D_i represents a dummy variable and equals 1 if respondent 'i' is an ANZ client and 0 if respondent 'i' is a non-client of ANZ. x_{1i} represents a dummy variable and equals 1 if respondent 'i' answers with present bias and equals 0 otherwise. x_{2i} also represents a dummy variable and equals 1 if respondent 'i' answers with future bias and equals 0 otherwise. This regression is undertaken for all three questions illustrated in table 4.1. Regression analysis follows both OLS and binary probit specifications.

x_{3i} represents a vector of other observable characteristics that may also indicate take up of savings facilities for individual 'i'. As with the regression in chapter 3, some variables include those directly related to the interviewee (i.e. the interviewee's age, sex and level of education) to control for the possibility that a person's characteristics may influence whether they take-up savings facilities. *A-priori*, there is no evidence to conclude whether the signs of these variables are positive or negative when regressing equation 4.1.

Proxies for wealth are included as variables within x_{3i} as wealthier households may want to keep any excess wealth in formal savings accounts. Additionally, the number of working adults in a household is included as households with more working adults may have more money to place in a formal savings account. The number of children in a household is also considered as people may want to save money in a formal institution to cater to the future needs of children. Finally, the number of people over 55 years old in a household was included as these people may have excess money collected throughout their life that they want to save to donate to other family members.

To test whether time-consistent preferences impact on an individual's decision to maintain an open savings account, equation 4.2 is regressed.

$$D_i = c_2 + \gamma_4 x_{4i} + \gamma_5 x_{3i} + \mu_{2i} \qquad \text{Eq 4.2}$$

x_{4i} represents a dummy variable and equals 1 if respondent 'i' answers with time consistency and equals 0 otherwise. Other variables are as previously specified.

Similar to the regression used in chapter 3 (equation 3.1), there may be omitted variables in equations 4.1 and 4.2 that also influence the dependent variable. As explained in chapter 3, this is a common limitation in other studies (see for example Meier and Sprenger 2008a).

4.5 Results

The following section considers the impacts of present-biased, future biased and time consistent preferences on maintaining an open savings account as well as heterogeneous results by gender. Directional influence and significance across all variables using the OLS model (tables 4.7, 4.8 and 4.9) are similar to the probit model (tables 4.7a, 4.8a and 4.9a).

As illustrated in answers to questions 1 and 2 in table 4.7, present-biased time preferences impact on the average person's decision to maintain an open savings account by 15.1 percent and 10.9 percent respectively[74]. These results are similar to the Ashraf *et al.* (2006) study that *existing* savers with present-biased time preferences are significantly more likely to open a commitment savings account.

[74] The average of the two results suggest that present-biased time preferences impact on the average person's decision to maintain an open savings account by approximately 13 percent.

Table 4.7 - Determinants of Maintaining an Open Savings Account (Time Inconsistency Analysis)
OLS
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Present-Biased Time Inconsistency Dummy Variable ^	**0.151****	**0.109***	0.070
	(0.040)	(0.055)	(0.100)
Future-Biased Time Inconsistency Dummy Variable ^^	**0.268****	0.041	**0.405*****
	(0.074)	(0.114)	(0.070)
Female	0.008	0.020	0.037
	(0.049)	(0.050)	(0.050)
People over 55	0.033	0.033	0.035
	(0.038)	(0.037)	(0.038)
Number of Working Adults in Household '	0.021	0.018	0.024
	(0.018)	(0.020)	(0.021)
Number of Children	0.007	0.007	0.005
	(0.016)	(0.016)	(0.017)
Food Consumed ''	**0.021****	**0.021****	**0.021****
	(0.008)	(0.008)	(0.008)
Roof Quality ^^^	0.027	0.032	0.036
	(0.071)	(0.069)	(0.070)
Wall Quality ^^^	-0.005	-0.002	-0.022
	(0.052)	(0.054)	(0.049)
Number of Bedrooms ^^^	0.042	0.027	0.058
	(0.085)	(0.080)	(0.082)
Interviewee's Age	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)
Interviewee's Education Level ^^^^	**0.066****	**0.063****	**0.047***
	(0.025)	(0.022)	(0.025)
Observations	499	499	499
Adjusted R^2	0.026	0.008	0.032

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with present-biased time inconsistency and 0 if a person answers otherwise.

^^ Dummy Variable equals 1 if a person answers a question with future-biased time inconsistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

'' If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 4.7a - Determinants of Maintaining an Open Savings Account (Time Inconsistency Analysis)
Probit
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Present-Biased Time Inconsistency Dummy Variable ^	**0.398*** **	**0.285***	0.179
	(0.109)	(0.146)	(0.256)
Future-Biased Time Inconsistency Dummy Variable ^^	**0.769** **	0.108	**1.367*** **
	(0.253)	(0.302)	(0.405)
Female	0.015	0.050	0.087
	(0.128)	(0.131)	(0.134)
People Over 55	0.084	0.088	0.092
	(0.100)	(0.097)	(0.101)
Number of Working Adults in Household '	0.055	0.046	0.062
	(0.047)	(0.051)	(0.054)
Number of Children	0.017	0.019	0.016
	(0.041)	(0.040)	(0.043)
Food Consumed "	**0.056** **	**0.054** **	**0.055** **
	(0.020)	(0.021)	(0.020)
Roof Quality ^^^	0.069	0.083	0.093
	(0.185)	(0.176)	(0.184)
Wall Quality ^^^	-0.012	-0.002	-0.061
	(0.133)	(0.139)	(0.129)
Number of Bedrooms ^^^	0.113	0.073	0.149
	(0.223)	(0.209)	(0.211)
Interviewee's Age	0.007	0.005	0.006
	(0.007)	(0.007)	(0.007)
Interviewee's Education Level ^^^^	**0.174** **	**0.163** **	**0.126** **
	(0.064)	(0.058)	(0.063)
Observations	499	499	499

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with present-biased time inconsistency and 0 if a person answers otherwise.

^^ Dummy Variable equals 1 if a person answers a question with future-biased time inconsistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Further answers to questions 1 and 3 suggest future-biased time preferences impact on the average person's decision to maintain an open savings account by 26.8 percent and 40.5 percent respectively[75]. It is uncertain why the influence of future-biased time preferences is much larger than the influence of present-biased time preferences. Additionally, comparisons with literature are not possible as there does not appear to be any study that considers the influence future-biased on human actions.

That people who exhibit present-biased time preference and are impatient for cash now want to 'keep it out of hands way' by depositing money in a bank is reasonable. However, is it rational that some people demonstrate patience for rewards now but are impatient for rewards in the future? Rubinstein (2005) argues affirmatively, citing an example of not eating an expensive chocolate in the near term and waiting to consume it in the distant term. Ashraf *et al.* (2006:647) provide another explanation, suggesting that people with future biased preferences are "flush with cash now, but foresees being liquidity constrained in six months". Attema *et al.* (2009:27) also support the concept of future-biased time consistency by showing that informal discussion with subjects of his study "indicated that they did not mind a delay much at first, but after a long wait they disliked further delays more". Additionally, there has been a steady rise in literature suggesting more people are likely to demonstrate future-bias than present bias (Holcomb and Nelson 1992; Scholten and Read 2006; Sayman and Onculer 2007; Attema *et al.* 2009 and Takeuchi 2008).

Why do some Solomon Islanders in this study demonstrate future-biased time preferences? Potentially, these people may not need food or money immediately due to excess current capacity however they may believe food or money could become scarce due to future uncertainties. For example, people may have lumpy cash flows, either through remittances or through unstable income flows from SMEs which provides more money now but less money in the future. As such, in the distant term, it is reasonable to assume that they prefer the safety of an immediate reward as opposed to a delayed reward.

[75] The average of the two results suggest that future-biased time preferences impact on the average person's decision to maintain an open savings account by approximately 34 percent.

Results to the majority of questions highlighted in table 4.7 reveal on average, households with higher value food consumption and a more educated survey respondent significantly impact on a survey respondent's decision to maintain an open formal savings account by approximately 2.1 percent and 5.9 percent[76] respectively.

It is reasonable that survey respondents who are more educated, and hence understand potential benefits from saving formally, are more likely to maintain open formal savings accounts (table 4.7a). Indeed, in Ashraf *et al.* (2006), higher education levels predict take-up of commitment savings facilities (although the measurements for education are not comparable between studies). Further, it is also reasonable to assume a survey respondent living in a wealthier household, as suggested by the higher value food items household members consume, is more likely to maintain an open savings account.

Ultimately when considering the answers to most questions, results suggest the average person who is time inconsistent is sophisticated enough to understand their self-control problems – be they in the present or future – and hence is more likely to maintain an open savings account. Further, table 4.8 illustrates across questions 1 and 3, time consistent preferences significantly impact on the average person's decision *not* to maintain an open savings account by 18.1 percent and 18.7 percent respectively[77]. Hence, the average person with time consistency is also sophisticated enough to understand their relatively higher level of self-control by being less likely to open a savings account (table 4.8a)[78].

Results in tables 4.9 and 4.9a reveal the influence of having present-biased time preferences, or future-biased time preferences, and being female is insignificant across the majority of questions when maintaining an open savings account. Thus unlike Ashraf *et al.*

[76] 6.5 percent is an average of the coefficients for interviewee's education level across question 1 (0.066), question 2 (0.063) and question 3 (0.047).

[77] The average of the two results suggest that time consistent preferences impact on the average person's decision not to maintain an open savings account by approximately 18.4 percent.

[78] When all specifications (present-biased time inconsistency, future-biased time inconsistency, patient time consistency and impatient time consistency) are included in a regression, people who are patiently time consistent and impatiently time consistent are significantly less likely to open savings accounts across answers to the first question. As explained in footnote 72, this is reasonable; people who are more consistent with their time preferences have more self-control and are hence less likely to require commitment devices. Across answers to the other two questions, patient time consistency and impatient time consistency do not significantly influence a person's decision to open a savings account.

(2006), female survey participants with present-biased time preferences are not more likely than male survey participants to engage in commitment devices.

Table 4.8 - Determinants of Maintaining an Open Savings Account (Time Consistency Analysis)
OLS
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Time Consistency Dummy Variable ^	**-0.181*** **	-0.088	**-0.187** **
	(0.034)	(0.055)	(0.067)
Female	0.009	0.023	0.032
	(0.049)	(0.050)	(0.049)
People Over 55	0.033	0.033	0.030
	(0.037)	(0.037)	(0.039)
Number of Working Adults in Household '	0.019	0.018	0.020
	(0.018)	(0.020)	(0.021)
Number of Children	0.006	0.006	0.005
	(0.015)	(0.016)	(0.016)
Food Consumed "	**0.022** **	**0.021** **	**0.022** **
	(0.008)	(0.008)	(0.008)
Roof Quality ^^^	0.029	0.031	0.040
	(0.072)	(0.069)	(0.071)
Wall Quality ^^^	-0.007	-0.004	-0.019
	(0.051)	(0.052)	(0.046)
Number of Bedrooms ^^^	0.045	0.027	0.052
	(0.084)	(0.081)	(0.080)
Interviewee's Age	0.003	0.002	0.003
	(0.003)	(0.003)	(0.003)
Interviewee's Education Level ^^^^	**0.065** **	**0.063** **	**0.054** **
	(0.023)	(0.022)	(0.023)
Adjusted R^2	0.026	0.010	0.020
Observations	499	499	499

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with time consistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 4.8a - Determinants of Maintaining an Open Savings Account (Time Consistency Analysis)
Probit
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Time Consistency Dummy Variable ^	**-0.488*** **	-0.231	**-0.498** **
	(0.096)	(0.147)	(0.190)
Female	0.018	0.056	0.079
	(0.127)	(0.131)	(0.128)
People Over 55	0.085	0.087	0.075
	(0.097)	(0.098)	(0.103)
Number of Working Adults in Household '	0.051	0.046	0.053
	(0.047)	(0.052)	(0.055)
Number of Children	0.016	0.016	0.012
	(0.039)	(0.041)	(0.041)
Food Consumed "	**0.057** **	**0.054** **	**0.057** **
	(0.021)	(0.021)	(0.020)
Roof Quality ^^^	0.076	0.081	0.103
	(0.186)	(0.176)	(0.182)
Wall Quality ^^^	-0.018	-0.007	-0.046
	(0.132)	(0.133)	(0.120)
Number of Bedrooms ^^^	0.121	0.072	0.135
	(0.221)	(0.212)	(0.208)
Interviewee's Age	0.007	0.006	0.007
	(0.007)	(0.007)	(0.007)
Interviewee's Education Level ^^^^	**0.170** **	**0.162** **	**0.142** **
	(0.061)	(0.058)	(0.060)
Observations	499	499	499

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with time consistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 4.9 - Determinants of Maintaining an Open Savings Account (Gender Analysis)
OLS
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Present-Biased Time Inconsistency Dummy Variable ^	0.123	0.308	0.247
	(0.342)	(0.311)	(0.397)
Future-Biased Time Inconsistency Dummy Variable ^^	0.258	**-0.525***	**0.562****
	(0.285)	(0.239)	(0.228)
Female	0.010	0.000	0.035
	(0.074)	(0.072)	(0.060)
Female * Present Biased Dummy Variable	-0.011	0.085	0.101
	(0.174)	(0.174)	(0.141)
Female * Future Biased Dummy Variable	0.011	0.091	-0.100
	(0.137)	(0.200)	(0.157)
Interviewee's age * Present Biased Dummy Variable	0.000	-0.004	-0.005
	(0.007)	(0.006)	(0.008)
Interviewee's age * Future Biased Dummy Variable	-0.001	**0.015***	-0.005
	(0.006)	(0.008)	(0.005)
Interviewee's education level * Present Biased Dummy Variable^^^^	0.031	-0.062	-0.040
	(0.087)	(0.068)	(0.141)
Interviewee's education level * Future Biased Dummy Variable^^^^	0.023	0.019	0.042
	(0.123)	(0.066)	(0.156)
People Over 55	0.033	0.031	0.034
	(0.040)	(0.037)	(0.040)
Number of Working Adults in Household '	0.020	0.017	0.025
	(0.019)	(0.022)	(0.021)
Number of Children	0.007	0.009	0.005
	(0.016)	(0.017)	(0.017)
Food Consumed "	**0.021****	**0.020****	**0.020****
	(0.008)	(0.008)	(0.009)
Roof Quality ^^^	0.027	0.030	0.039
	(0.073)	(0.070)	(0.070)
Wall Quality ^^^	-0.005	-0.003	-0.026
	(0.052)	(0.053)	(0.050)
Number of Bedrooms ^^^	0.041	0.023	0.062
	(0.088)	(0.086)	(0.085)
Interviewee's Age	0.003	0.002	0.003
	(0.004)	(0.003)	(0.003)
Interviewee's Education Level ^^^^	0.060*	**0.076****	0.047**
	(0.032)	(0.020)	(0.019)
Adjusted R^2	0.014	0.005	0.023
Observations	499	499	499

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with present-biased time inconsistency and 0 if a person answers otherwise.

^^ Dummy Variable equals 1 if a person answers a question with future-biased time inconsistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

Table 4.9a - Determinants of Maintaining an Open Savings Account (Gender Analysis)
Probit
Dependent Variable: Dummy equals 1 if respondent is a client and 0 if respondent is a non-client

	Question 1	Question 2	Question 3
Present-Biased Time Inconsistency Dummy Variable ^	0.256	0.811	0.632
	(0.942)	(0.824)	(1.022)
Future-Biased Time Inconsistency Dummy Variable ^^	0.521	-1.654**	2.174**
	(0.922)	(0.771)	(0.828)
Female	0.023	-0.004	0.089
	(0.189)	(0.183)	(0.154)
Female * Present Biased Dummy Variable	-0.050	0.234	0.257
	(0.461)	(0.465)	(0.362)
Female * Future Biased Dummy Variable	0.022	0.334	-0.856
	(0.523)	(0.560)	(0.542)
Interviewee's age * Present Biased Dummy Variable	0.001	-0.011	-0.013
	(0.021)	(0.016)	(0.021)
Interviewee's age * Future Biased Dummy Variable	0.001	0.046	-0.028
	(0.020)	(0.028)	(0.019)
Interviewee's education level * Present Biased Dummy Variable^^^^	0.109	-0.158	-0.098
	(0.235)	(0.178)	(0.369)
Interviewee's education level * Future Biased Dummy Variable^^^^	0.181	0.064	0.505
	(0.432)	(0.207)	(0.733)
People Over 55	0.083	0.085	0.090
	(0.106)	(0.097)	(0.105)
Number of Working Adults in Household '	0.053	0.047	0.067
	(0.049)	(0.057)	(0.055)
Number of Children	0.017	0.021	0.015
	(0.041)	(0.042)	(0.044)
Food Consumed "	**0.055****	**0.051****	**0.053****
	(0.019)	(0.021)	(0.022)
Roof Quality ^^^	0.070	0.078	0.106
	(0.186)	(0.177)	(0.185)
Wall Quality ^^^	-0.013	0.000	-0.069
	(0.132)	(0.134)	(0.133)
Number of Bedrooms ^^^	0.110	0.056	0.156
	(0.229)	(0.219)	(0.219)
Interviewee's Age	0.007	0.005	0.008
	(0.009)	(0.008)	(0.009)
Interviewee's Education Level ^^^^	**0.153***	**0.195*****	0.119**
	(0.081)	(0.051)	(0.048)
Observations	499	499	499

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with present-biased time inconsistency and 0 if a person answers otherwise.

^^ Dummy Variable equals 1 if a person answers a question with future-biased time inconsistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

4.6 Limitations

While this chapter has already noted potential bias due to omitted variables, there are other possible limitations to this study. These include potential bias due to the use of hypothetical as opposed to real rewards. Fernandez-Villaverde and Mukherji (2006:12) claim "most experiments presented in literature involve only hypothetical choices" and as such, people have little incentive to seriously think about their true preferences. The authors cite examples in the literature where field studies involving real monetary amounts present "much weaker evidence in favor of hyperbolic discounting" (Fernandez-Villaverde and Mukherji 2006:12) relative to experiments using hypothetical amounts.

Conversely Frederick and Loewenstein (2002:389) claim the use of hypothetical time preference questions and provision of real rewards "typically yield qualitatively similar results". He cites the work of Camerer and Robin (1999) as well as Kirby and Marakovic (1995) as examples of literature that supports his argument. Nevertheless, Frederick and Loewenstein (2002:389) do admit "systematic differences have been observed in some studies" between real and hypothetical rewards.

For the purposes of this study, the potential differences in answers when asking hypothetical time preference questions and presenting participants with real rewards cannot be definitively ascertained. This remains a limitation of the study.

Additionally answers to hypothetical time preference questions may be biased as it is not easy to ensure that everyone really understands the instructions properly. To mitigate potential bias emanating from this, an approach similar to the one taken by Ashraf *et al.* (2006) is considered. Specifically, whether people with greater education are more likely to answer questions in a particular way relative to less educated individuals is analysed. Results in table 4.10 indicate the level of education does not predict answers to hypothetical time preference questions and as such it is less likely that the average person failed to understand instructions properly.

Table 4.10 - Influence of Survey Respondent's Education Level on Answers to Hyperbolic Time Preferences
Survey Size: 499
OLS
Dependent Variable: Equals 1 If Survey Respondent Answers Impatiently and 0 if Survey Respondent Answers Patiently

	Answer to Question 1a	Answer to Question 1b	Answer to Question 2a	Answer to Question 2b	Answer to Question 3a	Answer to Question 3b
Female	-0.03	-0.053	-0.028	-0.019	-0.017	-0.067
	(0.062)	(0.042)	(0.076)	(0.070)	(0.056)	(0.051)
People over 55	0.025	0.031	0.014	0.002	(0.044)	-0.066**
	(0.034)	(0.036)	(0.041)	(0.035)	(0.026)	(0.027)
Number of Working Adults in Household '	0.037*	0.018	0.022	0.014	-0.015	-0.039
	(0.020)	(0.018)	(0.027)	(0.028)	(0.027)	(0.025)
Number of Children	(0.030)	-0.038*	(0.029)	0.000	(0.001)	(0.007)
	(0.017)	(0.018)	(0.023)	(0.013)	(0.018)	(0.010)
Food Consumed "	-0.028**	-0.017	-0.025**	-0.022*	-0.023	-0.016
	(0.008)	(0.011)	(0.006)	(0.010)	(0.013)	(0.010)
Roof Quality ^^^	-0.128**	-0.091*	(0.058)	(0.029)	(0.034)	0.005
	(0.057)	(0.050)	(0.056)	(0.063)	(0.045)	(0.038)
Wall Quality ^^^	0.035	-0.01	-0.022	0.035	0.011	0.008
	(0.043)	(0.035)	(0.045)	(0.033)	(0.054)	(0.050)
Number of Bedrooms ^^^	0.028	0.096	0.025	(0.024)	0.109	0.098
	(0.085)	(0.068)	(0.092)	(0.085)	(0.095)	(0.097)
Interviewee's Education Level ^^^^	0.039	0.018	0.028	0.052*	-0.007	0.024
	(0.036)	(0.030)	(0.025)	(0.027)	(0.032)	(0.034)
Observations	499	499	499	499	499	499
Adjusted R^2	0.050	0.030	0.028	0.024	0.022	0.024

For all variables, the first row represents the coefficient while the second row (in parentheses) represents the standard error clustered at village level.

^ Dummy Variable equals 1 if a person answers a question with present-biased time inconsistency and 0 if a person answers otherwise.

^^ Dummy Variable equals 1 if a person answers a question with future-biased time inconsistency and 0 if a person answers otherwise.

' Work is defined as any form of employment, be it part-time or full-time, that provides a source of income.

^^^ Roof Quality equals 1 if the roof is made from Copper and 0 if the roof is made from Sago Palm or Timber. Wall Quality equals 1 if walls are made from Timber and 0 if walls are made from Sago Palms. The number of bedrooms equals 1 if there are greater than 3 bedrooms in the house and 0 if there are equal to or less than 3 bedrooms in the house. Hence the higher the quality of roofs and walls, and the higher the number of bedrooms, the wealthier the household.

^^^^ Years of primary school, secondary school and tertiary school attendance are assumed to be 5, 10 and 15 years respectively and are hence as denoted 0, 1 and 2 respectively in the data set.

" If any member of the household consumed any of the following items in the week prior to the survey; coconut, kasava, potato, taro, panna, banana, sugar, rice, fish, twistees, bread or eggs, a value of 1 is recorded for each item consumed. As they are considered more valuable, if any member of the household consumed milk, pork, beef or chicken in the week before the survey was undertaken, a value of 2 is recorded for each item consumed. The total of the numbers recorded is used to calculate a number for 'food consumed'. Hence the higher the value of food consumed, the wealthier the household.

* Significance at the 10 percent level; ** Significance at the 5 percent level, *** Significance at the 1 percent level.

The focus on older people and male respondents may skew results towards this demographic. Indeed, the summary statistics reveal that the percentage of male respondents was approximately 57 percent while the average age of respondents was approximately 37 years. Hence, it may be inappropriate to generalise these findings as those applicable to all potential savings account holders.

Further, this study only considers people who answered patiently and impatiently. Failure to consider the possibility that some people also answer 'somewhat impatiently' may reduce robustness of results.

Finally, as with the study in chapter 3 and other quasi-experimental designs, there is the possibility that results may not be applicable to areas outside the study region. However, *a-priori*, there is nothing to suggest why such results are not representative of those across other areas of Guadalcanal.

4.7 Conclusion

Results of this chapter show people's present-biased or future-biased time-inconsistent preferences, demonstrating their commitment problems, positively and significantly impact on their decision to maintain an open savings account. Hence when considering these results in isolation, they support both the hypothesis and the argument of chapter 3 that policy makers should further investigate the benefits of expanding access to micro-savings in Pacific Island countries.

However, the summary statistics reveal when categorising answers to hypothetical time preference questions between time-consistency and time-inconsistency, the large majority of clients surveyed demonstrate time-consistency. This implies that the desire for commitment devices by individuals with commitment problems should not be the primary reason for expanding access to formal savings facilities. Further, results show the average person with time-consistent preferences is less likely to maintain an open savings account.

Ultimately this study reveals a survey respondent, be they present-biased, future-biased or time consistent, are on average sophisticated enough to understand their respective level of self-control. Additionally, while literature as well as results of this study suggests time inconsistent preferences may predict certain behaviour, given the prevalence of time-consistency in many studies, the impacts of time consistency should also be investigated. Finally, this study does not explore whether people who access savings accounts save optimally. Further research regarding levels of actual savings would provide greater clarity on this issue.

Appendix 4A

The following table illustrates answers to hypothetical questions categorised according to time preference for non-clients.

Table 4.A1 - Answers to Hypothetical Questions Categorised According to Time Preference for Non-Clients
Sample Size: 268

A	B	C	D	E	F
	Patient now, Patient later (patiently time consistent)	Impatient now, Impatient later (impatiently time consistent)	Impatient now, patient later (present-biased time inconsistent)	Patient now, Impatient later (future-biased time inconsistent)	Total
Question 1	43%	43%	11%	3%	100%
Question 2	38%	46%	11%	6%	100%
Question 3	47%	45%	8%	1%	100%
Average	43%	44%	10%	3%	100%

Chapter 5 – Impact of State-Run Newspapers on Political Opinions

5.0 Introduction

The role of newspapers in influencing political opinions and the drivers of newspaper bias have been widely documented. But what of newspaper bias in countries where the largest circulation of print-media is controlled by the government? To what extent can state-run newspapers be used as a propaganda tool to influence voter opinions and alter the democratic process? Such information is critical when ascertaining whether an incumbent government has effectively used state resources to promote policy agendas, particularly if "it is voters' preferences rather than political institutions that determine policy outcomes" (Besley and Preston 2007:1473).

To date, there has been little research, and no experimental study, examining the relationship between state-run media and political opinions. This lack of research is concerning given that the state has some control over the media in many developing countries[79].

The motivation of this study is to fill a void in literature by undertaking a randomised study on the impacts of state-controlled newspapers in a developing country. Sri Lanka, which is ranked 165th out of 173 countries for press freedom in the 2008 'reporters without borders annual index' (RWB 2008), is a good candidate to estimate the impacts of state-run newspaper bias. It is considered one of the most dangerous places for journalists (Lawson 2009) and has recently received negative international coverage for the murder and abduction of newspaper editors opposed to the government (Sirilal 2008). Indeed, a number of journalists have sought asylum in other countries while others have been held in detention by the government (Mihlar 2008).

This chapter investigates the question: "Does home delivery of state-run newspapers influence the political opinions of individuals to conform to the views of the state?" The

[79] Examples are Pakistan, Malaysia, China, Thailand, Vietnam, Fiji, Bangladesh and Sudan.

hypothesis is that home delivery of state-run newspapers *will* influence the political opinions of individuals to conform to the views of the state. A similar study by Gerber *et al.* (2009) experimentally considers the impact that two private newspapers with different ideologies have on voter actions in Washington D.C. This study will compare and contrast results from Gerber *et al.* (2009) while noting the clear differences across geography, interpretation of results and newspaper proprietorship between the two studies.

In May 2008, a baseline survey of 15 households randomly selected in each one of 56 separate villages (totalling 840 households) was undertaken[80]. From these 56 villages, 28 were randomly selected. Further, 15 households[81] within these 28 randomly selected villages were provided with intervention of 'a home delivered state-run newspaper every weekday and Sunday for approximately 10 weeks'. After these 10 weeks, a second round survey asking 824 respondents in all households[82] their opinions regarding topical issues in Sri Lanka was administered. Using baseline and second round survey data, impact is estimated by comparing individuals who received newspapers to individuals who did not receive newspapers[83].

This study is the first randomised study to consider the impact of newspaper bias on political opinions of individuals within a developing country. Results suggest that the hypothesis is partially correct; intervention influences the political opinions of people to conform to the views of the state across 'positive issues' (i.e. those that promote positive state actions) and across 'negative issues' (i.e. those that target opposition parties and other actors running against government policy). Conversely in most cases, intervention does not significantly influence the political opinions of people across 'defensive issues' (i.e. those that involve defending unpopular state actions). It is important to note that while results that are categorised into 'positive', 'negative' and 'defensive' issues, 'home delivery of state-run newspaper' is the only intervention in this study.

[80] Data was provided by a local consulting firm, International Scholar Professional Services Pty Ltd. The author of this dissertation provided technical advice on the collection of the survey data.
[81] These are the same 15 households that were surveyed during the baseline.
[82] 16 respondents from the baseline survey were not available for interview during the second round survey.
[83] For comparative purposes, impact is also estimated when answers to survey questions are aggregated at village level.

The structure of the remaining sections of this chapter is as follows. Section 5.1 provides important background information on the context of the study while section 5.2 explains the model. Section 5.3 describes the evaluation design while section 5.4 highlights the summary statistics. Section 5.5 discusses the results and section 5.6 presents some limitations. Section 5.7 concludes.

5.1 Background

The following section first provides a brief background of Sri Lanka and the district of Monaragala[84]. It then considers how various issues are postured with a pro-government perspective in state-run newspapers. The issues highlighted in state-run newspapers form the basis of the survey questionnaire used in this study.

5.1.1 Country and District Background

Sri Lanka is a country with approximately 20 million people of whom approximately 82 percent are Sinhalese, 7.9 percent are Sri Lankan Moors, 5.1 percent are Indian Tamil and 4.3 percent are Sri Lankan Tamil (Census 2001a)[85]. The country had been in a state of civil war for approximately 30 years where an anti-government group, known as Tamil Tigers or the Liberation Tigers of Tamil Eelam (LTTE), was fighting for a separate homeland for the ethnic minority Tamils. Its fortunes have oscillated from holding approximately one-third of the country's land mass to being ultimately eliminated as a conventional fighting force in 2009.

This study focuses on 56 villages in the district of Monaragala in Eastern Sri Lanka. The district represents approximately 1.9 percent of the country's population and has an approximately 95 percent Sinhalese concentration (Census 2001b)[86]. Its people have access to free education, free medical clinics and are able to participate in political elections. Of the districts surveyed in the Sri Lanka Household Income and Expenditure survey

[84] Monaragala is sometimes spelt Moneragala.
[85] Information was sourced from the Sri Lanka Department of Census and Statistics and relates to the 2001 census. Note, this 2001 Census only covers non-conflict areas and consequently, the percentage of Tamil Citizens is under-represented. Hence the 20 million population figure is an estimate.
[86] Information was sourced from the Sri Lanka Department of Census and Statistics and relates to the 2001 census

2006/2007[87], Monaragala is the second poorest, its people have the second lowest ownership of televisions and the lowest ownership of personal computers. Hence electronic media access is low relative to other parts of the country.

Until late 2007, Monaragala was subject to several incursions by the Tamil Tigers. After the area was brought under government control, it was expected this province with a 94.5 percent Singhalese population would be more favourable to the government. Indeed in 2008 elections, in an adjoining district that previously also had strong Tamil Tiger presence, 52.96 percent supported the government while 44.52 percent supported the main opposition (Elections 2008).

5.1.2 Content of State-Run Newspapers

The pro-government state-run newspapers distributed to households for the purposes of this study include the Dinamina paper during the weekdays, and its sister publication, the Siliumina paper on Sunday[88]. These papers are written in Sinhala and command the largest circulation in the country of 75,000 per weekday and 265,000 every Sunday (ANCL 2008). Assuming that a newspaper is read on average by six ethnically Sinhalese people per day[89], this circulation translates into a readership of 2.13 percent and 7.54 percent of the rural Sinhalese population for the Dinamina and Silumina papers respectively[90]. The circulation

[87] 19 districts from a total of 26 were involved in the survey. The remaining 7 districts are all included within conflict zones and consequently were not surveyed.

[88] Home delivery is an unusual mode of newspaper acquisition in rural areas and newspapers are generally purchased through street vendors. This is unlikely to influence the experimental analysis of the ITT effect as any substitution (if it exists) would on average, impact both treatment and control groups equally. Refer section 5.2 for more details.

[89] There are 5 to 7 readers per copy for Indian newspapers (PCI 2010) and there are 6 readers per copy for a Singhalese newspaper, Rivira (Nation 2010). As there is no information on readers per copy for the Dinamina and Silumina papers, an estimate of 6 readers per copy was used.

[90] The number of ethnically Sinhalese people according to the last census (in 2001) was 13,876,245 (Census 2001a). In India, the distribution of newspapers between urban and rural areas was approximately 50-50 (NRS 2006). Note data for this distribution does not appear to exist in Sri Lanka. Hence, assuming 50 percent of circulated newspapers reach the rural population and given that approximately 76 percent of Sri Lankans live in rural areas (UNESCAP 2004), an estimated readership figure for rural Sri Lankans is 2.13 percent and 7.54 percent every weekday and Sunday respectively. Refer Appendix 5A for calculations.

within the district studied could not be sourced[91]. The cost of the newspaper is minimal, representing less than 0.08 percent of the average rural monthly household income[92].

In 2008, there were several noteworthy issues in Sri Lanka reflected differently in state-run newspapers and pro-opposition newspapers. Again, while there is only one intervention, for the purpose of separating out results, the information contained in the newspapers are categorised into positive issues (those promoting positive actions of the state), negative issues (those targeting opposition parties and other actors running against government policy) and defensive issues (those defending unpopular implications of state actions).

In state-run newspapers, positive issues regularly focused on the government's military victories against the Tamil Tigers[93]. In 2002 a ceasefire was brokered which lasted until 2007 when the government annulled it citing violations by the Tamil Tigers. Between 2007 and 2009, a government offensive was launched to retake land held by the Tamil Tigers. On May 17th 2009, the Tamil Tigers admitted defeat and the civil war was officially over.

State-run newspapers also positively reported on international support for the government's war against the Tamil Tigers[94]. While countries, particularly Western countries, urged the Tamil Tigers and government to return to the negotiating table, they rarely reprimanded military actions by the Sri Lankan government. Canada recently banned the Tamil Tigers, joining other major industrialised nations to do so. Further there have been arrests of Tamil Tigers operatives in the US, Canada, Italy, Australia and the EU which were uncommon prior to the 2002 ceasefire agreement.

When targeting the main political opposition (the UNP), the state-run newspapers engaged in negative reporting. For example two articles appearing in the state-run newspapers stated "UNP leader ... remains in this country but champions cause of terrorism" and "UNP-JVP plot to betray innocent people" (Dinamina, June 17th, 2008). Conversely on the same day, a

[91] The circulation of newspapers per district was not available on the internet. When contacted, the newspaper stated that it did not have district circulation information available.
[92] The average monthly household income is 24,039 rupees and the cost of the newspaper is 20 rupees (HIES 2007).
[93] Refer Appendix 5B for examples of newspaper articles.
[94] Refer Appendix 5B for examples of newspaper articles.

pro-opposition paper stated; "Though none go with me still I will fight: Ranil"[95] (Daily Mirror, June 17th 2008). This bias has previously been documented by an independent 'centre for policy alternatives' study which noted 94 percent of political articles in state-run newspapers in the run up to the 2004 election had unfavourable articles relating to the opposition (CPA 2005).

The state-run newspapers also used negative reporting to portray International Non-Governmental Organisations as being pro-Tamil Tigers. They accused internationally funded Sri Lankan organisations, as well as the Economist, Human Rights Watch, Amnesty International and Caritas of "invariably" presenting "a pro LTTE, pro-separatist spin" and being "highly critical of the elected Sri Lankan Government" (Dinamina, June 17th, 2008). Conversely pro-opposition newspapers generally supported the contribution of International Aid Agencies. For instance one such paper quoted references from the US ambassador that "INGOs[96] in Sri Lanka came under unjustifiable attack despite the good work they did in this country" (Daily Mirror, Sept 06, 2008).

Opposition newspapers, and to an extent, international media, cited the government's poor treatment of journalists. Amnesty International claimed "at least 10 Sri Lankan media workers have been killed over the past two years, while others have been abducted, tortured or illegally detained" (Reuters, June 6th, 2008). Routinely the pro-opposition newspapers accused the government of being complicit in these crimes claiming for instance, "Govt launches war on media not terror – UNP" (Daily Mirror, June 20th, 2008) and "Government urged to respect media rights" (Daily Mirror, June 23rd, 2008). This stance had largely been supported internationally with 29 media organisations around the world urging the United Nations to put pressure on the Sri Lankan government to protect journalists on June 22nd. Further, the international media organisation, "Agence Française de Presse", claimed "media rights watchdogs describe Sri Lanka as one of the most dangerous places in the world for journalists after Iraq" (AFP, May 28, 2008).

[95] 'Ranil' is the first name of the leader of the Sri Lankan opposition.
[96] INGOs are International Non Governmental Organisations. They are referred to as International Aid Agencies throughout this chapter.

Conversely, state-run newspapers largely printed defensive articles on the government's media record, citing opposition propaganda and hypocrisy. For instance, in the article titled "Media Freedom" (Dinamina, June 14th, 2008), the author claimed "the UNP's attempts to position itself as the greatest supporter of media freedom and freedom of expression, faces a major challenge from its own contemptible record when in office". Further, the country's media minister insisted "the government was safeguarding media freedom by allowing media personnel to independently perform their duties" (Dinamina, June 7th, 2008) and highlighted his development of a committee for journalists to underscore their grievances (Dinamina, June 25th, 2008).

State-run newspapers rarely commented on international criticism relating to human rights violations or if they did, reported them with a defensive spin. For instance, on June 15th, despite Sri Lanka losing its seat on the United Nations Human Rights Council (UNHRC), the state-run newspaper praised the government for receiving 109 votes in support of its candidature for the council[97]. Further, while on June 16th, the Paris-based aid organisation, Action Contre la Faim (ACF) claimed there was a "blatant lack of will of the Sri Lankan government to establish the truth" relating to the murder of 17 aid workers in 2006, there appeared to be no reference to this matter in the state-run newspaper in the same month.

State-run newspapers defended the government's handling of the cost of living which had increased substantially from 2007 to June 2008[98]. They argued the country was suffering the consequences of a "global food crisis" and explained that the government has taken measures to limit its impact through state sponsored programs (Dinamina, 28th May 2008). They also cited articles from international organisations supporting their case (Dinamina, 28th May, 2008). Conversely, the pro-opposition newspapers placed the blame largely on the government, contrasting the "50 percent increase" in essential items faced by the common people over the "last three months" with the "elected representatives roaming the streets in their BMWs and Range Rovers" (Daily Mirror, 23rd May, 2008).

[97] Refer Appendix 5B for examples of newspaper articles.
[98] Refer Appendix 5B for a description on how the cost of living has increased.

Clearly, the state-run newspapers undertake positive, negative and defensive reporting across a range of issues. The newspaper reporting in relation to these issues form the basis of the questions asked during baseline and second round surveys as highlighted in table 5.1. The answers to these questions form the dependent variables of regressions estimated in section 5.2.

Table 5.1: Survey Questions

Survey Question 'i'		Potential answers to survey question 'i'				
		1^	2^	3^	4^	5^
A	Are International Aid Agencies pro-Tamil Tigers?	Definitely Not	Unlikely to be Pro-Tamil Tigers	Uncertain	Generally Pro-Tamil Tigers	Very Pro-Tamil Tigers
B	How likely are you to support an opposition party in the next election?	Very Unlikely	Unlikely	Uncertain	Likely	Very Likely
C	How do you view the government's handling of the Cost of Living?	Very Unfavourably	Somewhat Unfavourably	Ok	Somewhat Favourably	Very Favourably
D	How do you view the government's handling of the civil war?	Very Unfavourably	Somewhat Unfavourably	Ok	Somewhat Favourably	Very Favourably
E	What is the level of international support given to the government against terrorism?	None	Low	Medium	High	Very High
F	How do you view the government's human rights record?	Very Unfavourably	Somewhat Unfavourably	Ok	Somewhat Favourably	Very Favourably
G	How do you view the government's treatment of journalists?	Very Unfavourably	Somewhat Unfavourably	Ok	Somewhat Favourably	Very Favourably

Topics related to questions 'A' and 'B' are considered 'negative issues', topics related to questions 'D' and 'E' are considered 'positive issues' while topics related to questions 'C', 'F' and 'G' are considered 'defensive issues'.

^ Refers to the coding used when regressing equations 5.1 to 5.5

5.2 Model

There have been various theoretical models considering the source of newspaper bias (Besley and Prat 2006; Mullainathan and Shleifer 2005; Baron 2006; Groseclose and Milyo 2005; Gentzkow and Shapiro 2006). These models are based on different underlying assumptions of the state of the world. For instance, literature argues that reporting bias in newspapers is influenced by journalists with specific career interests (Baron 2006), by tradeoffs between news signals received by media outlets and government bribes to media outlets (Besley and Prat 2006), when newspapers re-enforce the beliefs of their audiences (Mullainathan and Shleifer 2005) and when readers feedback into news reporting (Gentzkow and Shapiro 2006).

However, when considering a state owned newspaper, media bias is driven by the views of the state. Hence, in this situation, reporting bias is assumed to be *exogenously* given. The model derived in this section adds to literature by being the first to consider bias from state-run newspapers. Subsequent analysis will test the validity of some aspects of this model.

The model of interest is $v = rz(s) + ql(o)$ where 'v' represents people's political opinions (with higher values of 'v' implying people conform to state views), 's' represents information sourced from home delivered state-run newspapers and 'o' represents alternative information sources (such as other media sources and word of mouth). $z(s)$ and $l(o)$ are functions that demonstrate how 's' and 'o' influence political opinions of people in targeted villages while 'r' is the probability a person will believe information from home delivered state-run newspapers and 'q' is the probability a person will believe information from alternative sources.

Given the randomised nature of this study, where the influence of $ql(o)$ is considered statistically similar between the average treatment and control group member, the impact from home-delivery of state-run newspapers can be isolated. Hence, the model of interest is now $v = rz(s)$.

Assuming that $z'(s) > 0$, then the more information sourced from state-run newspapers, the more likely people's political opinions conform to those of the state. This study will partially test this assumption by determining if the views of people who received home delivered state-run newspapers conform with those of the state (i.e. the intent to treat effect), and then determining if people who received and regularly read[99] a home delivered state-run newspaper conform to the views of the state (i.e. the treatment on treated effect) to a greater degree than those who simply received a home-delivered state-run newspaper[100].

[99] During the second round survey, people who were home delivered newspapers (i.e. treatment group members) were asked whether they read newspapers 3 or more times a week. The 298 people who answered 'yes' were considered regular readers while the 115 people who answered 'no' were considered irregular readers. Readership levels of treatment group members pre-intervention and control group members are unknown. However, assumptions about readership levels are made later in this section.

[100] It is assumed greater readership implies that greater information is gathered.

To test the intent to treat (ITT) effect, the OLS fixed effects model described in equation 5.1 is regressed.

$$Y_{jvt} = a_{jv} + \gamma_1 Time_t \, X \, Treatment_v + \beta_1 Time_t + \mu_{jvt} \qquad \text{Eq 5.1}$$

Y_{jvt} represents an ordinal measure (from 1 to 5) from the answer to question 'i' (in table 5.1) for individual 'j' in village 'v' at time 't' (where t=1 for the baseline survey and t=2 for the second round survey). a_{jv} is a fixed effect for individual 'j' in village 'v'. $Time_t$ is a dummy that takes value 0 at time 1 and 1 at time 2. When considering the ITT effect, $Treatment_v$ represents a dummy variable that equals 1 if the village is a treatment village and 0 if the village is a control village.

Despite random assignment, 56 villages may not be a sufficiently large sample to ensure that observable and unobservable characteristics of the average treatment and control group member have a statistically similar influence on answers to survey questions. Hence, equation 5.1 eliminates potential noise created by characteristics within the error term by subtracting baseline data from second round data using an OLS fixed effects approach[101].

If the results of the fixed effects OLS estimation are similar to the results of an OLS estimation using only second round data, then it can be assumed that observable and unobservable characteristics that influence the dependent variable are statistically similar between the average control group member and treatment group member. The approach of using only second round survey data in OLS estimations is popular as collecting baseline data is an unnecessary cost if randomisation is undertaken appropriately (see for example the OLS model used in Gerber *et al.* 2009). Hence, for comparative purposes an OLS estimation using only second round data is also regressed. Refer equation 5.2.

$$Y_{jv2} = a + \gamma_2 Treatment_v + \varepsilon_{jv2} \qquad \text{Eq 5.2}$$

[101] Note, an ordered probit fixed effect model produces biased coefficients (Neyman and Scott 1948). Also note that a fixed effects model is the same as a first difference model over one time period (Wooldridge 2001).

Y_{jv2} represents an ordinal measure (from 1 to 5) gathered from the answer to question 'i' (in table 5.1) for individual 'j' in village 'v' at time '2'[102]. To determine if the OLS model produces coefficients with the same directional and statistical influence as a linear probability model, equation 5.2 is also regressed using an ordered probit model.

Additionally, as randomisation was undertaken at village level, some may argue answers to questions should be grouped at the village level. Hence equation 5.3 is also regressed.

$$Y_{vt} = a_v + \gamma_3 Time_t \, X \, Treatment_v + \beta_3 Time_t + + \mu_{vt} \qquad \text{Eq 5.3}$$

Y_{vt} represents an ordinal measure gathered for the average answer to question 'i' (in table 5.1) across all individuals in village 'v' at the baseline survey (t=1) and the second round survey (t=2). a_v is a fixed effect for village 'v'. $Treatment_v$ represents a dummy variable that equals 1 if the village is a treatment village and 0 if the village is a control village.

To test the treatment effect on the treated (i.e. the influence of intervention amongst people who regularly read the newspaper[103]), the following assumption is made; in the absence of intervention, people in treatment and control villages do not regularly read the newspaper. Given that the district being investigated is the poorest and the estimated readership is very low as a percentage of the Sinhalese population (4.84 percent[104]), this is a reasonable assumption.

Due to random assignment, *if* control villages did receive intervention, it is assumed that the correlation between regular readership and intervention would be the same as that experienced in the treatment group. Hence, living in a treatment villages is an appropriate instrument to estimate regular readership levels. Note the practice of using treatment

[102] In equation 5.2 there are no independent variables that are fixed effects and the only potential fixed effects are contained in the error term. Hence, equation 5.1 which eliminates any potential fixed effects in the error term produces estimators that are at least as unbiased and efficient as those produced in equation 5.2.
[103] Refer footnote 99 for a definition of regular readership.
[104] This number is the average of 2.13 and 7.54 which were numbers previously illustrated in Section 5.1.2. It assumes each newspaper is read on average by six people. The calculation of 4.84 percent is illustrated in Appendix 5A.

villages as instruments is undertaken in other randomised studies (Ashraf *et al.* 2006; Gine *et al.* 2009).

The first wave of an instrumental variables (IV) regression is as follows:

$$Regular\ Readership_{jvt} = a_{jv} + \gamma_4 Time_t\ X\ Treatment_v + \beta_4 Time_t + \omega_{jvt} \quad \text{Eq 5.4}$$

$Regular\ Readership_{jvt}$ represents a dummy variable that equals 1 if a treatment village respondent regularly reads the newspaper and 0 if a treatment group respondent irregularly reads the newspaper or the respondent lived in control villages (i.e. because it is assumed no control village respondents are regular readers).

The second wave is as follows:

$$Y_{jvt} = a_{jv} + \gamma_5 Time_t\ X\ \widehat{Regular\ Readership_{jv}} + \beta_5 Time_t + \varsigma_{jvt} \quad \text{Eq 5.5}$$

All variables are as previously described. When analysing the treatment effect on the treated (TOT), an Instrumental Variables (IV) fixed effects model is used.

Importantly, if the assumption that control group members do not read newspapers is violated, the IV estimate produced refers to the Local Average Treatment Effect (LATE), not the IV-TOT. The IV-LATE estimates the impact of reading newspapers among people who have received home delivered newspapers[105] – regardless of whether people read newspapers through other sources (i.e. such as purchases through street vendors). The IV-TOT estimates the impact of reading newspapers among people who have received home delivered newspapers – assuming that people *do not* read newspapers through other sources. Clearly, the IV-LATE effect is not as useful as the IV-TOT effect. As such, results relating to the IV-TOT effect should be interpreted with caution given the assumption that control group members do not read *any* newspapers – home delivered or through street vendors.

[105] Recall, it was confirmed that neither treatment nor control group members received home-delivered newspapers.

Note that Gine, Karlan and Zinman (2009) issue a similar caution when using an IV-TOT approach in their analysis.

Reconsider equations 5.1. and 5.5 and the questions in table 5.1. If coefficients γ_1 and γ_5 in equations 5.1 and 5.5 respectively demonstrates a significant directional impact that favours the view of the state and $|\gamma_5| > |\gamma_1|$, then $z'(s) > 0$ is accurate to an extent[106]. This would imply that $\gamma_1$and γ_5 are positive for all 'i'[107].

5.3 Evaluation Design

The following section describes the experimental design used in this study.

In May 2008, 15 households[108] were randomly selected in each of the 56 villages surveyed in the Monaragala district. The households in 28 selected villages were then assigned to the treatment group while the households in the remaining 28 villages were assigned to the control group. Treatment households were home delivered newspapers every weekday and Sunday for 10 weeks (i.e. received intervention). Impact of intervention is measured by comparing treatment groups to control groups at both an individual level and at a village level.

Village selection into treatment and control groups was undertaken sequentially; there was approximately an 80 percent chance that a village selected was of a different type to the previous village selected (i.e. in 46 instances a control village was followed by a treatment

[106] Clearly, to test the accuracy of $z'(s) > 0$ in its entirety, the influence of a variety of readership levels on political opinions of people has to be estimated. This model only considers three levels of readership; those who do not read state-run newspapers (control group members), those who irregularly read state-run newspaper (115 people within treatment groups) and those who regularly read state-run newspapers (298 people within treatment groups who read home delivered state-run newspapers at least 3 times a week).

[107] As illustrate in table 5.1, question B is "How likely are you to support an opposition party in the next election?" where a higher value on the 5 point scale denotes more likely. Hence the intervention of state-run newspapers would influence the perceptions of individuals to converge to those of the state if people are less likely to support an opposition party at the next election (i.e. γ_1 is negative and the answers to question B are of a *lower* value on the 5 point scale). Nevertheless, to make the analysis easier in the following section, answers to the question "How likely are you to support an opposition party in the next election?" is converted to its negative; "How likely are you to NOT support an opposition party in the next election?". Hence in the results section 5.5, a positive γ_1 implies a more pro-government stance.

[108] A simple flick of a coin was used to determine if households (within a selected village) were selected for the survey (heads implied a household would be surveyed while tails implied a household would not be surveyed).

village or vice versa) and approximately a 20 percent chance that a village selected was of a similar type to the previous village (i.e. in 5 instances, a treatment village was followed by another treatment village while in 5 other instances, a control village was followed by a control village)[109]. Hence in 10 instances, a control village was located next to a control village and a treatment village. The minimum distance between villages was 1.8 km. Critically, no treatment villages were selected based on an *a-priori* belief that individuals in these villages would be more or less susceptible to newspaper bias.

Village selection was undertaken in this particular way to enable estimation of potential inter-village spillover effects caused by the sharing of newspapers between people in different villages. Under this experimental design, control village positioning followed two patterns; the first pattern involved 17 control villages being situated next to 2 treatment villages while the second pattern involved 11 control villages being situated next to only 1 treatment village[110]. However, if a traditional experimental approach was taken (i.e. village selection into treatment and control groups was determined on a 50 percent probability basis), more than two distinct patterns could exist. For instance, a control village could be surrounded by 2 control villages. The spillover effect, if any, on such villages may be different to the spillover effect if a control village was located next to a control village and a treatment village. Hence in this study, spillover bias can be measured by comparing the impact of intervention using all treatment villages and the 11 control villages selected that follow the first pattern, to the impact of intervention using all treatment villages and the 17 control villages that follow the second pattern. Analysis using a traditional randomisation technique would create more 'patterns' and hence complicate the analysis of spillover bias[111].

Admittedly, there may be legitimate arguments that the benefits from undertaking a traditional randomised approach outweigh the benefits of undertaking a more complicated analysis of spillover bias. To reduce doubts about the validity of the design, a fixed effects

[109] Refer Appendix 5C for a map of Monaragala and a more detailed explanation of the randomisation process.
[110] Recall in 10 instances, a control village was located next to a control village and a treatment village. This implies that in these 10 instances, a control village was only located next to one treatment village. Additionally, the final selected control village was only located next to one treatment village. Hence a total of 11 control villages were only located next to one treatment village. Refer Appendix 5C for further details.
[111] Refer section 5.5.3 for consideration of spillover bias.

analysis is undertaken, as well as a comparison of dependent variables at baseline to demonstrate similarity in answers between the average treatment and control group member pre-intervention[112]. Further, similarity of results between the fixed effects model and the OLS model using second round survey data only (which is traditionally used in randomised studies) are also illustrated.

To reduce spillover bias caused by the sharing of newspapers at an intra-village level, different households within the same village were not selected as treatment and control groups. Further, control group members indicated they did not receive a home delivered newspaper during the intervention period, thus reducing the likelihood of substitution bias.

The same questions asked in the baseline were asked during the second round survey. In total there were 840 responses to questions highlighted in table 5.1 during the baseline survey. In the second round survey there were 824 responses; only 16 households in 7 separate treatment villages and 9 separate control villages did not participate[113]. Bias due to program dropout is unlikely to significantly alter results as dropout rates are approximately the same across groups and only represent 2.3 percent of the survey sample. Note, people's reading patterns prior to intervention were not considered.

Unlike the study in chapter 3, program placement was random and all program participants were selected during the baseline survey. Hence bias related to non-random program placement and selection bias is not problematic. Further, the fixed effects approach eliminates the influence of time-invariant effects while the 10 week study period is reasonably short to assume that time-variant effects are unlikely to be problematic[114]. Thus, unlike analysis undertaken in both chapters 3 and 4, the study in this chapter does not suffer from omitted variable bias.

[112] The baseline comparison is illustrated in Summary Statistics section 5.4.

[113] During the baseline survey, interviewees were informed they would be approached to undertake another survey in approximately 3 months time. This potentially supported the high response rate during the second round.

[114] Fixed effect models with much longer intervention periods do not explicitly consider the impacts of time-variant characteristics on dependent variables (see for example Banerjee *et al.* 2006).

As with the case in chapters 3 and 4, there was a preference to interview older males as South Asian families are traditionally patriarchal with the eldest son having significant authority over his siblings (Ahmed and Lemkau 2000). If no male of appropriate age was present, an older female respondent was selected. Further, if an older person would be present at a later time during the day, interviewers would revisit the homes. The enumerators confirmed that all surveyed people could read by asking them to read a consent form out loud. That everyone selected could read is reasonable as the literacy rate in Monaragala is 86 percent (Census 2001b). All respondents were ethnically Singhalese which is not surprising as they form the largest ethnic block in the district[115].

5.4 Summary Statistics

The summary statistics of people surveyed, illustrated in table 5.2, reveals 58 percent of respondents were male and were on average, 39 years old in control villages. In treatment villages, 61 percent of respondents were male and were on average, 40 years old. This difference in age and sex is insignificant between the average control group individual and treatment group individual.

Table 5.2: Balance Test for Age and Sex
Mean, T-statistic, F-Statistic

	Control	Treatment	T-stat P-Value	F-Stat P-Value
Age	38.99 (8.737)	39.79 (8.894)	0.189	0.792
Sex^	57.62% (0.495)	61.19% (0.488)	0.293	1.000
Observations	420	420		

^Percentage of Male Respondents

Age is represented by mean value. Values in parenthesis represents the standard error.

The t-test estimates the null hypothesis that the average treatment group village is statistically similar to the average control group village across a particular variable. The ANOVA F-test estimates the null hypothesis that all villages are statistically similar to each other across a particular variable.

More importantly, table 5.3 illustrates answers to survey questions were insignificantly different between the average treatment and control group member at the individual level during the baseline survey.

[115] Refer Section 5.1.1 Country and District Background.

Table 5.3: Balance Test for Answers to Survey Questions at Baseline
Mean, T-statistic, F-statistic

	Control^	Treatment^	T-stat P-Value	F-Stat P-Value
A Are International Aid Agencies pro-Tamil Tigers?	3.331	3.460	0.144	0.582
	(1.144)	(1.114)		
B How likely are you to support an opposition party in the next election?	3.202	3.250	0.551	0.924
	(1.084)	(1.066)		
C How do you view the government's handling of the cost of living?	2.212	2.202	0.891	0.882
	(0.992)	(1.016)		
D How do you view the government's handling of the civil war?	3.752	3.779	0.693	0.948
	(0.971)	(0.989)		
E What is the level of international support given to the government against terrorism?	3.017	3.071	0.533	0.825
	(1.140)	(1.115)		
F How do you view the country's human rights record?	3.388	3.464	0.378	1.000
	(1.111)	(1.127)		
G How do you view the government's handling of journalists?	3.114	3.100	0.843	0.711
	(1.022)	(1.020)		
Observations	420	420		

^ The first row for each question 'i' represents the average answer to question 'i' illustrated in table 1 for the sample frame. The second row (in parenthesis) represents the standard error.

The t-test estimates the null hypothesis that the average treatment group village is statistically similar to the average control group village across a particular variable. The ANOVA F-test estimates the null hypothesis that all villages are statistically similar to each other across a particular variable.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

Table 5.4 breaks down the answers to questions A to G (illustrated in table 5.1), gathered during the baseline survey, across control and treatment group members. The data demonstrates the degree to which people conformed to the government view pre-intervention.

Results for question 'A' suggest that approximately the same number of people believe that International Aid Agencies are generally pro-Tamil Tigers (approximately 21 percent), very pro-Tamil Tigers (approximately 27 percent) or are uncertain (approximately 25 percent). This may suggest that people's views largely conform to the strong anti-International Aid Agency sentiment promoted in the government media.

Results for question 'B' suggest many people are uncertain as to whom they are going to vote for the in the next election (approximately 30 percent) while more people appear to be pro-opposition (approximately 41 percent) than pro-government (approximately 29

percent)[116]. This is surprising as the results of the presidential election in Monaragala (in 2005) indicated that the incumbent president achieved 56 percent of the vote (Elections 2005). Further, given the popularity of the incumbent party at the time of the study, it would be expected that there would be a greater percentage of people stating they were pro-government relative to pro-opposition. A potential explanation is that of the 246 people in this experiment who stated they were uncertain of how they would vote in the next election, the majority would vote for the government.

Results for question 'C' indicates that the vast majority of people view the government's handling of the cost of living very unfavourably (approximately 27 percent) or somewhat unfavourably (approximately 39 percent). This is not surprising considering the significant increase in the cost of living since 2007[117]. Clearly, these views do not represent a position that would be favoured by the government.

[116] Pro-government supporters are considered those who answered unlikely or very unlikely when asked whether they would support an opposition party in the next election while pro-opposition supporters are considered those who answered likely or very likely when asked whether they would support an opposition party in the next election.
[117] Refer Appendix 5B for further details.

Table 5.4: Percentage of Respondents Answering each Baseline Question According to Scale (Entire Sample)

A Are International Aid Agencies pro-Tamil Tigers? (Higher on the scale implies a more pro-government stance).	Definitely Not		Unlikely to be Pro-Tamil Tigers		Uncertain		Generally Pro-Tamil Tigers		Very Pro-Tamil Tigers	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	10%	6%	20%	18%	24%	26%	21%	22%	26%	27%
B How likely are you to support an opposition party in the next election? (Higher on the scale implies a more **anti-government** stance)	Very Unlikely		Unlikely		Uncertain		Likely		Very Likely	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	7%	5%	23%	24%	30%	29%	24%	26%	17%	16%
C How do you view the government's handling of the cost of living? (Higher on the scale implies a more pro-government stance).	Very Unfavourably		Somewhat Unfavourably		Ok		Somewhat Favourably		Very Favourably	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	26%	28%	39%	38%	23%	21%	10%	10%	1%	2%
D How do you view the government's handling of the civil war? (Higher on the scale implies a more pro-government stance).	Very Unfavourably		Somewhat Unfavourably		Ok		Somewhat Favourably		Very Favourably	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	0%	1%	10%	10%	28%	25%	38%	37%	24%	26%
E What is the level of international support given to the government against terrorism? (Higher on the scale implies a more pro-government stance).	None		Low		Medium		High		Very High	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	11%	11%	31%	26%	23%	25%	16%	23%	19%	16%
F How do you view the country's human rights record? (Higher on the scale implies a more pro-government stance).	Very Unfavourably		Somewhat Unfavourably		Ok		Somewhat Favourably		Very Favourably	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	6%	7%	22%	21%	22%	20%	26%	26%	24%	27%
G How do you view the government's handling of journalists? (Higher on the scale implies a more pro-government stance).	Very Unfavourably		Somewhat Unfavourably		Ok		Somewhat Favourably		Very Favourably	
Scale	1		2		3		4		5	
Percentage of Survey Responses	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	4%	5%	29%	27%	29%	27%	29%	33%	9%	7%

Observations in Control Group = 420. Observations in Treatment Group = 420.

Results for question 'D' suggest that the majority of the people believe the government is handling the war somewhat favourably and very favourably (total of approximately 63 percent). This is not surprising given the large military gains experienced by the government since the beginning of 2007.

Results for question 'E' suggest that people consider the level of international support for the government against terrorism with relatively even distribution across people who state there is 'low' support (approximately 28 percent), 'medium' support (approximately 24 percent), 'high' support (approximately 20 percent) and 'very high' support (approximately 18 percent). As only approximately 11 percent of people consider international support for terrorism is 'very low', the perceptions of survey respondents are more skewed towards those favoured by the government.

Results for question 'F' highlight that people view the government's human rights record relatively evenly across people who view the record 'somewhat unfavourably' (approximately 21 percent), 'ok' (approximately 21 percent), somewhat favourably (approximately 26 percent) and very favourably (approximately 25 percent). Very few people view the government's human rights record very unfavourably (approximately 6 percent) which may suggest that more people are likely to adhere to the government's preferred position on its human rights record.

Results for question 'G' suggest the government's treatment of journalists is almost evenly split between people who believe they are treated somewhat unfavourably (approximately 28 percent), treated 'ok' (approximately 28 percent) and treated somewhat favourably (approximately 31 percent). While the government would ideally like more people to believe that journalists are treated favourably, this data implies that pre-intervention, both domestic and international criticism relating to the rights of journalists was not overly effective.

Table 5.5a reveals the change in answers from the baseline survey to the second round survey for control group members. It shows the average control group member's belief that the government is effectively handling the cost of living has significantly reduced by 12.97

percent and the average control group member's belief that the government is effectively handling the war has significantly increased by 3.90 percent. Across the remaining questions, the average answers are statistically the same between the survey periods.

Table 5.5a: Change in Answers to Survey Questions of Control Group Members
Mean, T-statistic, Percentage Change

	Baseline^	Second Round^	T-stat P-Value	Percentage Change^^
A Are International Aid Agencies pro-Tamil Tigers?	3.328	3.353	0.788	0.73%
	(1.307)	(1.288)		
B How likely are you to support an opposition party in the next election?	3.190	3.170	0.815	-0.61%
	(1.176)	(1.202)		
C How do you view the government's handling of the cost of living?	2.214	1.927	**0.000**	**-12.97%**
	(0.987)	(0.894)		
D How do you view the government's handling of the civil war?	3.740	3.886	**0.028**	**3.90%**
	(0.941)	(0.957)		
E What is the level of international support given to the government against	3.039	3.071	0.721	1.04%
	(1.300)	(1.241)		
F How do you view the country's human rights record?	3.388	3.331	0.505	-1.69%
	(1.234)	(1.241)		
G How do you view the government's handling of journalists?	3.127	3.085	0.571	-1.32%
	(1.038)	(1.057)		
Observations	411	411		

Only Respondents who answered in both the baseline and second round survey were included in the analysis

^ The first row for each question 'i' represents the average answer to question 'i' illustrated in table 1 for the sample frame. The second row (in parenthesis) represents the standard error.

^^ Percentage change refers to the percentage change in the average answer from the baseline survey to the second round survey.

As illustrated in table 5.5b, the change in answers from the baseline survey to the second round survey across treatment group members is more pronounced. The average treatment group member's belief that the government is effectively handling the cost of living has significantly reduced by 14.84 percent, slightly more than that experienced by control group members. The significant increase of 8.14 percent in the average treatment group member's belief that the government is effectively handling the war is more pronounced than the 3.9 percent increase experienced by the average control group member. Further, as opposed to control group members, the average treatment group member's view that the government receives greater international support against terrorism has significantly increased by 9.97 percent and the average treatment group member's likely support for an opposition party in the next election has significantly reduced by 9.36 percent.

Table 5.5b: Change in Answers to Survey Questions of Treatment Group Members
Mean, T-statistic, Percentage Change

		Baseline^	Second Round^	T-stat P-Value	Percentage Change^^
A	Are International Aid Agencies pro-Tamil Tigers?	3.462	3.613	0.072	4.34%
		(1.241)	(1.153)		
B	How likely are you to support an opposition party in the next election?	3.232	2.930	**0.000**	**-9.36%**
		(1.134)	(1.098)		
C	How do you view the government's handling of the cost of living?	2.203	1.877	**0.000**	**-14.84%**
		(1.034)	(0.874)		
D	How do you view the government's handling of the civil war?	3.780	4.087	**0.000**	**8.14%**
		(0.977)	(0.843)		
E	What is the level of international support given to the government against terrorism?	3.085	3.392	**0.000**	**9.97%**
		(1.246)	(1.128)		
F	How do you view the country's human rights record?	3.458	3.337	0.169	-3.50%
		(1.274)	(1.254)		
G	How do you view the government's handling of journalists?	3.097	3.104	0.921	0.23%
		(1.041)	(1.050)		
Observations		413	413		

Only Respondents who answered in both the baseline and second round survey were included in the analysis

^ The first row for each question 'i' represents the average answer to question 'i' illustrated in table 1 for the sample frame. The second row (in parenthesis) represents the standard error.

^^ Percentage change refers to the percentage change in the average answer to question 'i' from the baseline survey to the second round survey.

5.5 Results

This section presents aggregate results, heterogeneous results, results from the analysis of spillover effects and a summary of results. Recall, while this study only estimates the impact of one intervention (i.e. home delivery of state-run newspapers), the results will be categorised under 'positive issues', 'negative issues' and 'defensive issues'.

5.5.1 Aggregate Results

OLS results from impact of intervention across intent to treat results (ITT) at a fixed effects individual and village level, the treatment-on-the-treated (TOT) results at a fixed effects individual level and ITT cross-sectional estimates at an individual level are highlighted in tables 5.6a to 5.6c.

The ITT results and the TOT results in table 5.6a illustrate intervention (i.e. home delivery of state-run newspapers) significantly increases the average person's belief that the government is handling the civil war successfully by 0.162 and 0.224 points respectively on a 5 point scale and significantly increases the average person's belief that the government is supported internationally against terrorism by 0.276 and 0.382 points respectively on a 5

point scale. Hence intervention appears to influence political opinions of individuals to conform to those of the state across 'positive issues'.

Table 5.6a: Impacts from Intervention across Entire Sample
Results across Positive Issues (i.e. issues that promote positive state actions)

	Dependent Variable: Answer to question D				Dependent Variable: Answer to question E			
	Government's handling of the civil war (5 point scale, higher on the scale implies a more pro-government stance)				Level of International support given to the government against terrorism (5 point scale, higher on the scale implies a more pro-government stance)			
	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^
Time Period 2*Treat Dummy (ITT)	0.162***	0.176***		0.202**	0.276**	0.264**		0.322***
	(0.043)	(0.037)		(0.063)	(0.096)	(0.100)		(0.083)
Time Period 2*Regular Readers (TOT)			0.224***				0.382**	
			(0.060)				(0.133)	
Time Period 2	0.146***	0.133***	0.146***		0.032	0.055	0.032	
	(0.029)	-0.028	(0.031)		(0.087)	-0.094	(0.068)	
Mean Dependent Variable	3.875	3.875	3.875	3.987	3.137	3.137	3.137	3.232
Observations	1,648	1,648	1,648	824	1,648	1,648	1,648	824
R^2 (Within)	0.131	0.759	0.119		0.025	0.282	0.018	
R^2 (Overall)	0.020	0.284	0.015	0.012	0.013	0.178	0.011	0.018

ITT refers to Intent to Treat while TOT refers to Treatment effect on the Treated. FE refers to Fixed Effects and IV refers to Instrumental Variables.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

^ Assignment to treatment is used as an instrument for regular readership in IV regressions. Regular Readership equals zero if the survey respondent was not a regular reader and equals 1 if the survey respondent was a regular reader.

^^ This regression is only undertaken using second round data.

*** Significance at the 1 percent level, ** Significance at the 5 percent level, *** Significance at the 10 percent level.

Further, the ITT results and TOT results in table 5.6b suggest intervention significantly increases the average person's belief that International Aid Agencies are pro-Tamil Tigers by 0.126 and 0.174 points respectively on a 5 point scale and significantly increases the average respondent's belief that they would not vote for an opposition party by 0.283 and 0.392 points respectively on a 5 point scale. Hence intervention also appears to influence political opinions of individuals to conform to those of the state across 'negative issues'.

Table 5.6b: Impacts from Intervention across Entire Sample
Results across Negative Issues (issues that target opposition parties and actors with an anti-government platform)

	Dependent Variable: Answer to question A				Dependent Variable: Answer to question B			
	Pro-Tamil Tigers bias of International Aid Agencies (5 point scale, higher on the scale implies a more pro-government stance)				Likely to not support an opposition party in the next election (5 point scale, higher on the scale implies a more **pro-government** stance)			
	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^
Time Period 2*Treat Dummy (ITT)	0.126***	0.128**		0.260**	0.283***	0.291***		-0.241**
	(0.034)	(0.038)		(0.085)	(0.046)	(0.048)		(0.080)
Time Period 2*Regular Readers (TOT)			0.174***				-0.392***	
			(0.048)				(0.066)	
Time Period 2	0.024	0.023	0.024		0.019	0.031	-0.019	
	(0.020)	-0.02	(0.024)		(0.027)	0.033	(0.034)	
Mean Dependent Variable	3.439	3.439	3.439	3.483	3.139	3.139	3.139	3.050
Observations	1,648	1,648	1,648	824	1,648	1,648	1,648	824
R^2 (Within)	0.046	0.371	0.029		0.096	0.629	0.043	
R^2 (Overall)	0.006	0.0949	0.004	0.011	0.010	0.163	0.006	0.011

ITT refers to Intent to Treat while TOT refers to Treatment effect on the Treated. FE refers to Fixed Effects and IV refers to Instrumental Variables. Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same reported level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

^ Assignment to treatment is used as an instrument for regular readership in IV regressions. Regular Readership equals zero if the survey respondent was not a regular reader and equals 1 if the survey respondent was a regular reader.

^^ This regression is only undertaken using second round data.

*** Significance at the 1 percent level, ** Significance at the 5 percent level, *** Significance at the 10 percent level.

These results support the majority of literature that indicates newspaper bias impacts on individual opinions (Dalton *et al.* 1998; Besley and Burgess 2002; Dietrich, Heider, Matschinger and Angermeyer 2006).

Conversely, as illustrated in table 5.6c, intervention does not appear to alter people's political opinions across the majority of 'defensive issues'. The only exception is that ITT and TOT results suggest intervention significantly increases the average person's belief that the government is treating journalists favourably by 0.049 points and 0.067 points respectively on a 5 point scale. Further even given this exception, the impact of intervention on people's perceptions regarding the government's treatment of journalists is smaller in terms of magnitude and significance relative to the impact of intervention on political opinions across 'positive' or 'negative' issues.

Table 5.6c: Impacts from Intervention across Entire Sample

Results across Defensive Issues (issues that involve defending unpopular state actions)

	Dependent Variable: Answer to question C				Dependent Variable: Answer to question F				Dependent Variable: Answer to question G			
	Government's handling of the Cost of Living (5 point scale, higher on the scale implies a more pro-government stance)				Government's human rights record (5 point scale, higher on the scale implies a more pro-government stance)				Government's treatment of journalists (5 point scale, higher on the scale implies a more pro-government stance)			
	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^	Individual level (OLS, FE)	Village level (OLS, FE)	Individual level (IV, FE)^	Individual level (OLS) ^^
Time Period 2*Treat Dummy (ITT)	-0.040	-0.042		-0.050	-0.063	-0.071		0.006	0.049*	0.032		0.019
	(0.047)	(0.055)		(0.062)	(0.040)	(0.044)		(0.087)	(0.028)	(0.031)		(0.073)
Time Period 2*Regular Readers (TOT)			-0.055				-0.087				0.067*	
			(0.065)				(0.055)				(0.039)	
Time Period 2	-0.287***	-0.284***	-0.287***		-0.058**	-0.058**	-0.058**		-0.041**	-0.029	-0.041**	
	(0.032)	(0.044)	(0.033)		(0.027)	(0.027)	(0.028)		(0.019)	(0.019)	(0.020)	
Mean Dependent Variable	2.056	2.056	2.056	1.902	3.380	3.380	3.380	3.334	3.101	3.101	3.101	3.095
Observations	1,648	1,648	1,648	824	1,648	1,648	1,648	824	1,648	1,648	1,648	824
R^2 (Within)	0.175	0.697	0.174		0.027	0.273	0.026		0.005	0.032	0.006	
R^2 (Overall)	0.026	0.252	0.025	0.001	0.001	0.027	0.000	0.000	0.000	0.001	0.000	0.000

ITT refers to Intent to Treat while TOT refers to Treatment effect on the Treated. FE refers to Fixed Effects and IV refers to Instrumental Variables.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same reported level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

^ Assignment to treatment is used as an instrument for regular readership in IV regressions. Regular Readership equals zero if the survey respondent was not a regular reader and equals 1 if the survey respondent was a regular reader.

^^ This regression is only undertaken using second round data.

*** Significance at the 1 percent level.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

Hence at an aggregate level, the hypothesis that home delivery of state-run newspapers will impact the political opinions of individuals in villages within a developing country is only applicable across 'positive' and 'negative' issues.

Results in tables 5.6a and 5.6c demonstrate the time effect significantly influences a variety of estimations. In particular, table 5.6a illustrates that over the survey period, the average person is significantly more likely to believe the government is handling the civil war effectively by 0.146 points on a 5 point scale. This is reasonable due to the military victories secured by the government during this period[118]. Further, table 5.6c highlights that due to the time effect, the average person is significantly less likely to believe that the government is handling the cost of living effectively, maintaining a favourable human rights record and treating journalists favourably by 0.287 points, 0.058 points and 0.041 points respectively on a 5 point scale. This is also reasonable as during the survey period, the cost of living increased significantly and alleged human rights violations as well as alleged harassment of journalists were noted in opposition media[119].

In all instances, the TOT results are 1.38 (or the 413 treatment group members interviewed during the second round survey divided by the 298 regular readers) times greater than the value of the ITT results. Hence impact of intervention is felt most greatly among those who regularly read state-run newspapers. These results are consistent with other studies that show TOT results are larger than ITT results (Gine, Karlan and Zinman 2009; Ashraf *et al.* 2006).

The OLS village level results are similar in statistical significance and directional influence to the OLS individual level results. Hence there appears to be little variation in results when grouping answers to survey questions at the village level and individual level.

Tables 5.6a to 5.6c include cross-sectional estimates where only individual level second round data for control group and treatment group members are used. Results suggest that overall, directional influences and level of significances are similar between the individual OLS cross-sectional estimates and individual OLS fixed effects estimates (albeit not to the

[118] Refer Section 5.1 Background Information.
[119] Refer Section 5.1 Background Information.

same level as between the results from the individual OLS fixed effects estimates and village level OLS fixed effects estimates). Hence this implies that in the large majority of cases, on average, observable and unobservable characteristics captured in the error term of the cross-sectional OLS regression are statistically similar between treatment and control group members. Appendix 5D illustrates that the directional influences and level of significances are similar between the OLS cross-sectional estimates and ordered probit cross-sectional estimates at the individual level.

It is interesting to compare the aggregate results of this study with those of Gerber *et al.* (2009) which focus on how home delivery of newspapers impacts on voters' election choices in the Washington DC area of the United States. In the Gerber *et al.* (2009) study, the impact of reading a liberal leaning newspaper (i.e. pro-Democratic newspaper) was to increase the probability of *actually* voting for the Democratic candidate by 11.2 percentage points ($p < 0.014$). In this study, to get a sense of magnitudes, the 5 point scale that determines whether a person was pro-government or pro-opposition is now reduced to a 2 point scale. Thus, as illustrated in table 5.6d, if those people who answered 'uncertain' when asked "How likely are you to support an opposition party in the next election?" were considered pro-government, then the impact of receiving state-run newspapers (i.e. the ITT effect) is to increase the *probability* of voting for the government at the next election by 13.8 percentage points ($p < 0.000$). Alternatively, if those people who answered 'uncertain' when asked the same question were considered pro-opposition, then the impact of receiving state-run newspapers is to increase the *probability* of voting for the government at the next election, by 7.3 percentage points ($p < 0.000$). Hence the true value for this study is likely to exist somewhere in the vicinity of 7.3 percentage points and 13.8 percentage points[120].

[120] Refer Appendix 5E for the results of two 3 x 3 transition matrices, where the change from 'pro-government', 'uncertain' and 'pro-opposition' stances between time 1 and time 2 is illustrated for control group members and treatment group members. Analysis shows that the strongest influences intervention had was to limit an increase in the number of 'uncertain' people becoming 'pro-opposition' supporters and to increase the number of 'pro-opposition' supporters becoming 'pro-government' supporters.

Table 5.6d: Impacts of Intervention on Political Preferences Across Entire Sample

	Dependent Variable: Answer to question B Likely to not support an opposition party in the next election (2 point scale, higher on the scale implies a more pro-government stance)	
	Individual level (OLS, FE)	Individual level (IV, FE)^
Panel A		
Time Period 2*Treatment Dummy (ITT)	0.138***	
	(0.022)	
Time Period 2*Regular Readers (TOT)		0.191***
		0.032
Time Period 2	-0.022	-0.022
	(0.016)	(0.016)
Observations	1648	1648
R^2 (Within)	0.064	0.002
R^2 (Overall)	0.010	0.003
Panel B		
Time Period 2*Treatment Dummy (ITT)	0.073***	
	(0.020)	
Time Period 2*Regular Readers (TOT)		0.101***
		0.028
Time Period 2	0.01	0.01
	(0.014)	(0.014)
Observations	1648	1648
R^2 (Within)	0.039	0.012
R^2 (Overall)	0.005	0.001

ITT refers to Intent to Treat while TOT refers to Treatment effect on the Treated. FE refers to Fixed Effects and IV refers to Instrumental Variables. Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same reported level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

^ Assignment to treatment is used as an instrument for regular readership in IV regressions. Regular Readership equals zero if the survey respondent was not a regular reader and equals 1 if the survey respondent was a regular reader.

Panel A assumes that people who answered uncertain when asked "How likely are you to support an opposition party in the next election?" are pro-government supporters. Hence, if survey respondents answered very unlikely or unlikely when asked the question, the Dependent Variable = 0 (and 1 otherwise).

Panel B assumes that people who answered uncertain when asked "How likely are you to support an opposition party in the next election?" are pro-opposition supporters. Hence, if survey respondents answered very unlikely, unlikely or uncertain when asked the question, the Dependent Variable = 0 (and 1 otherwise).

Note that the negative coefficient implies the impact of reading a state-run newspaper is to *decrease* the probability of voting for the *opposition* at the next election. This is interchangeable with "the impact of reading a state-run newspaper is to *increase* the probability of voting for the *government* at the next election".

*** Significance at the 1 percent level, ** Significance at the 5 percent level, *** Significance at the 10 percent level.

The impact of reading state-run newspapers or liberal leaning newspapers on political opinions appears to be similar across these two areas in the United States and Sri Lanka. However, as a caveat to this result, there are important differences between these two studies. Most obviously, people in Monaragala have less access to alternative media sources relative to people in Washington DC (recall that Monaragala has the second lowest ownership of televisions and the lowest ownership of personal computers in Sri Lanka). Further, Gerber *et al.* (2009) estimate the impact of private newspapers while this study estimates the impact of state-run newspapers. Finally, Gerber *et al.* (2009) estimate the actual impact on voter outcomes while this study estimates the probable impact on voter outcomes. Hence, the results of the two studies are not completely comparable.

Consider a situation where everyone in Sri Lanka received state-run newspapers. Given the circulation of the Sinhalese, Tamil and English state-run newspapers on Sundays is 510,000 (ANCL 2008), the country's population is approximately 20 million and assuming that on average six people read each newspaper[121], the implication is that 85 percent of the population do not have access to state-run newspapers. Assume in the 2005 presidential election everybody received state-run newspapers, the probability of voting for the government as suggested by results in table 5.6d were translated into actual votes and results were replicated to all voters across Sri Lanka. Under these assumptions, the incumbent party's candidate would have increased his vote share from 50.3 percent by approximately 6.2 percentage points or 11.3 percentage points[122] given the impact of receiving state-run newspapers is to increase the probability of voting for the government at the next election by 7.3 percentage points or 13.8 percentage points respectively.

Now consider the impact on voting share in the 2005 presidential election if the state-run newspaper had been abolished and results of this study were replicable to that time period. Assuming six people read every newspaper circulated, the Sinhala, Tamil and English state-run newspapers would reach approximately 15.3 percent[123] of the entire population. Assume also that the proportion of readers was the same among voters and non-voters and as a result of the state-run newspaper being abolished, those voters who did not vote for the government voted for the opposition candidate instead. Under these assumptions, the incumbent party candidate's voting share would reduce from 4,887,152 votes by a net amount of approximately 299,143 votes or 569,177 votes[124] if the impact of regularly reading a newspaper (i.e. the TOT effect[125]) was to increase the probability of voting for the government at an election by 10.1 percentage points or 19.1 percentage points[126] respectively. Given that the incumbent party candidate won the 2005 presidential election

[121] It is estimated there are 6 readers per copy for Sinhalese Newspapers (refer footnote 89).
[122] 6.2 percentage points and 11.7 percentage points are calculated as 85 percent x 7.3 percentage points and 85 percent x 13.8 percentage points respectively.
[123] Refer Appendix 5F, reference point 'f', for calculation.
[124] Refer Appendix 5F, reference point 'k', for calculation.
[125] The TOT results are used instead of the ITT results as it is assumed an average of 6 people actually read a newspaper on a regular basis.
[126] Refer Appendix 5F, reference point 'a', for calculation.

by only 180,786 votes, the impact of state-run newspapers on voters' political opinions can be influential in determining election outcomes.

5.5.2 Heterogeneous Results

The following considers heterogeneous results across gender, political affiliations and age.

Gender

Table 5.6e illustrates due to intervention, the average female is significantly more likely to believe that the government receives international support against terrorism and views the government's human rights record favourably by 0.242 points and 0.152 points respectively on a 5 point scale. Further, the average female who receives intervention is significantly less likely to believe that the government is treating journalists favourably by 0.096 points on a 5 point scale. Hence overall, intervention does not appear to have a significantly different influence over males or females.

Political Affiliations

Table 5.6f illustrates that in general, intervention does not have significantly different influences across pro-opposition, uncertain and pro-government voters across answers to survey questions illustrated in table 5.1[127]. The only exception is that the more pro-opposition a person is, the significantly more likely (at the 10 percent level) they are to believe that international aid agencies are pro-Tamil Tigers by 0.07 points on a 5 point scale. This could be attributed to the fact people are likely to read news that conforms to their views (Mullainathan and Shleifer 2005). Moreover, it is reasonable to expect that across an issue, the impacts of exposure of state-run newspapers on pro-opposition supporters, who may not access such information often, are more pronounced than the exposure of state-run newspapers to pro-government supporters, who may already be aware of the government stance on particular issues.

Age

Table 5.6g highlights that intervention does not significantly influence people's political opinions across different age groups.

[127] Question 'B' is omitted as the answers to question 'B' were used to determine if people were 'pro-government', 'uncertain' in their political leanings or 'pro-opposition'.

Table 5.6e: Impacts of Intervention Across Gender (Entire Sample)
Sample Frame: 485 Males, 339 Females

	Dependent Variables:						
	Answer to question A	Answer to question B	Answer to question C	Answer to question D	Answer to question E	Answer to question F	Answer to question G
	Pro-Tamil Tigers bias of International Aid Agencies	Likely to not support an opposition party in the next election	Government's handling of the Cost of Living	Government's handling of the civil war	Level of International support given to the government against terrorism	Government's human rights record	Government's treatment of journalists
	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)
	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)
Time Period 2*Treat Dummy	0.082*	0.271***	-0.064	0.178**	0.320**	-0.019	0.087**
	(0.042)	(0.057)	(0.061)	(0.059)	(0.124)	(0.055)	(0.039)
Female * Time Period 2 * Treat Dummy (ITT)	0.112	0.036	0.062	-0.04	-0.088	-0.095	-0.096*
	(0.072)	(0.096)	(0.095)	(0.087)	(0.197)	(0.080)	(0.056)
Time Period 2	0.026	0.004	-0.286***	0.141***	-0.073	-0.124***	-0.051*
	(0.024)	(0.034)	(0.040)	(0.040)	(0.114)	(0.038)	(0.026)
Female * Time Period 2	-0.003	0.055	-0.002	0.012	0.242*	0.152**	0.023
	(0.042)	(0.056)	(0.066)	(0.059)	(0.175)	(0.052)	(0.037)
Mean dependent variable	3.439	3.139	2.056	3.875	3.137	3.380	3.101
Observations	1,648	1,648	1,648	1,648	1,648	1,648	1,648
R^2 (Within)	0.052	0.099	0.175	0.131	0.030	0.036	0.010
R^2 (Overall)	0.005	0.010	0.027	0.020	0.016	0.002	0.001

ITT refers to Intent to Treat while FE refers to Fixed Effects.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy and female dummy are 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

*** Significance at the 1 percent level.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

Table 5.6f: Impacts of Intervention Across Political Preferences (Entire Sample)

	Dependent Variables:					
	Answer to question A	Answer to question C	Answer to question D	Answer to question E	Answer to question F	Answer to question G
	Pro-Tamil Tigers bias of International Aid Agencies	Government's handling of the Cost of Living	Government's handling of the civil war	Level of International support given to the government against terrorism	Government's human rights record	Government's treatment of journalists
	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)
	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)
Time Period 2*Treat Dummy (ITT)	0.070*	-0.231***	0.163**	-0.113	-0.041	-0.044
	(0.036)	(0.050)	(0.043)	(0.146)	(0.043)	(0.034)
Pol Pref * Time Period 2 * Treat Dummy (ITT)	0.073*	0.064	0.066	-0.079	-0.001	0.033
	(0.041)	(0.058)	(0.050)	(0.116)	(0.047)	(0.036)
Time Period 2	0.051	-0.109	0.098	0.397**	-0.073	0.005
	(0.051)	(0.073)	(0.062)	(0.160)	(0.063)	(0.042)
Pol Pref	0.001	-0.004	-0.004	0.119	-0.039	-0.066**
	(0.035)	(0.057)	(0.047)	(0.086)	(0.039)	(0.033)
Pol Pref * Time Period 2	-0.041	-0.05	-0.015	0.129	-0.016	0.003
	(0.025)	(0.039)	(0.032)	(0.106)	(0.033)	(0.024)
Mean dependent variable	3.439	2.056	3.875	3.137	3.380	3.101
Observations	1,648	1,648	1,648	1,648	1,648	1,648
R^2 (Within)	0.050	0.176	0.133	0.031	0.029	0.012
R^2 (Overall)	0.007	0.023	0.021	0.009	0.000	0.001

ITT refers to Intent to Treat while FE refers to Fixed Effects. When asked "How likely are you to support an opposition party in the next election?", Pol Pref is a variable that equals 0 if a person answers unlikely or likely (i.e. pro-government), 1 if a person answers uncertain and 2 if a person answers likely or very likely (i.e. pro-opposition).

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

*** Significance at the 1 percent level.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

Table 5.6g: Impacts of Intervention Across Age (Entire Sample)

	Dependent Variables:						
	Answer to question A	Answer to question B	Answer to question C	Answer to question D	Answer to question E	Answer to question F	Answer to question G
	Pro-Tamil Tigers bias of International Aid Agencies	Likely to not support an opposition party in the next election	Government's handling of the Cost of Living	Government's handling of the civil war	Level of International support given to the government against terrorism	Government's human rights record	Government's treatment of journalists
	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)	(5 point scale, higher on the scale implies a more pro-government stance)
	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)	OLS FE (Individual level)
Time Period 2*Treat Dummy (ITT)	0.132	0.115	-0.237	-0.087	0.611	0.033	0.154
	(0.157)	(0.211)	(0.214)	(0.198)	(0.439)	(0.183)	(0.130)
Age * Time Period 2 * Treat Dummy (ITT)	0.000	0.004	0.005	0.006	-0.009	-0.002	-0.003
	(0.004)	(0.005)	(0.005)	(0.005)	(0.011)	(0.005)	(0.003)
Time Period 2	0.052	0.088	-0.071	0.283**	-0.338	0.004	-0.123
	(0.111)	(0.149)	(0.151)	(0.140)	(0.311)	(0.130)	(0.092)
Age * Time Period 2	-0.001	0.002	-0.006	-0.004	0.009	-0.002	0.002
	(0.003)	(0.004)	(0.004)	(0.004)	(0.008)	(0.003)	(0.002)
Mean dependent variable	3.439	3.139	2.056	3.875	3.137	3.380	3.101
Observations	1,648	1,648	1,648	1,648	1,648	1,648	1,648
R^2 (Within)	0.046	0.096	0.177	0.133	0.027	0.029	0.006
R^2 (Overall)	0.006	0.010	0.026	0.021	0.012	0.001	0.000

ITT refers to Intent to Treat while FE refers to Fixed Effects.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy and the age dummy are 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

*** Significance at the 1 percent level.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

5.5.3 Analysis of Spillover Effects between Villages

As discussed in section 5.3, there is the possibility information from people who received home delivered newspapers was shared between members of different villages. For instance, it is possible that while treatment group members lived in separate villages to control group members, people residing in the same areas may be able to discuss political developments as highlighted in newspapers. If this is the case, spillover bias may exist.

To account for this, the study makes use of the particular nature of the experimental design. Recall that 17 control villages are located next to two treatment villages and 11 control villages are only located next to one treatment village[128]. If dummy variable coefficients are consistently greater when estimating regressions using data from the 11 control villages and treatment villages versus data from the 17 control villages and treatment villages, then spillover bias may exist. Table 5.7 indicates that spillover bias is not problematic with coefficients of dummy variables being similar when undertaking these two regressions.

5.5.4 Summary of Results

Overall, results indicate at an aggregate level, the hypothesis that home delivery of state-run newspapers will impact the political opinions of individuals in villages to conform to the views of the state is only applicable across results categorised as 'positive' and 'negative' issues. Further the impact of regularly reading a home delivered newspaper (TOT effect) more greatly influences the political opinions of individuals to conform to the views of the state than receiving a home delivered newspaper (ITT effect). Hence at an aggregate level, in reference the model developed in section 5.2, $z'(s) > 0$ applies across positive and negative issues[129]. Intervention does not have a significant impact on political opinions across the majority of 'defensive issues'.

Differences across age, gender and political preferences are not very pronounced across answers to the majority of questions. Additionally, bias due to the spillover of information in state-run newspapers from treatment villages to control villages does not appear to be problematic.

[128] The next closest villages refer only to those considered in this experiment.
[129] As a caveat to this result, refer footnote 106.

Table 5.7: Analysis of Spillover Effects - Impacts of Intervention Across Two Sets of Control Groups

	Dependent Variables:													
	Answer to question A		Answer to question B		Answer to question C		Answer to question D		Answer to question E		Answer to question F		Answer to question G	
	Pro-Tamil Tigers bias of International Aid Agencies		Likely to not support an opposition party in the next election		Government's handling of the Cost of Living		Government's handling of the civil war		Level of International support given to the government against terrorism		Government's human rights record		Government's treatment of journalists	
	(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)		(5 point scale, higher on the scale implies a more pro-government stance)	
	OLS FE (Individual level)		OLS FE (Individual level)		OLS FE (Individual level)		OLS FE (Individual level)		OLS FE (Individual level)		OLS FE (Individual level)		OLS FE (Individual level)	
Data Used^	Control 11	Control 17	Control 11	Control 17	Control 11	Control 17	Control 11	Control 17	Control 11	Control 17	Control 11	Control 17	Control 11	Control 17
Time Period 2*Treat Dummy (ITT)	0.132***	0.122**	0.247***	0.307***	-0.006	-0.062	0.209***	0.131**	0.252*	0.291**	0.015	-0.113**	0.05	0.047
	(0.039)	(0.040)	(0.059)	(0.050)	(0.062)	(0.053)	(0.055)	(0.050)	(0.139)	(0.122)	(0.051)	(0.046)	(0.039)	(0.031)
Time Period 2	0.019	0.028	0.056	-0.004	-0.321***	-0.265***	0.099**	0.177***	0.056	0.016	-0.136**	-0.008	-0.043	-0.040*
	(0.027)	(0.028)	(0.045)	(0.034)	(0.052)	(0.041)	(0.044)	(0.039)	(0.133)	(0.114)	(0.042)	(0.035)	(0.032)	(0.023)
Mean dependent variable	3.484	3.461	3.094	3.131	2.041	2.058	3.907	3.881	3.193	3.164	3.393	3.378	3.117	3.090
Observations	1150	1324	1150	1324	1150	1324	1150	1324	1150	1324	1150	1324	1150	1324
R^2 (Within)	0.059	0.050	0.117	0.110	0.185	0.171	0.153	0.150	0.049	0.034	0.044	0.026	0.003	0.004
R^2 (Overall)	0.006	0.006	0.012	0.014	0.029	0.026	0.023	0.024	0.015	0.016	0.003	0.001	0.000	0.000

ITT refers to Intent to Treat while FE refers to Fixed Effects.

^ Control 11 denotes regressions that only includes data from treatment villages and the 11 control villages that were located next to, at the most, one treatment village. Control 17 denotes regressions that only includes data from treatment villages and the 17 control villages that were located next to two treatment villages. If the coefficients of dummy variables are consistently greater when estimating regressions using data from the 11 control villages and treatment villages versus data from the 17 control villages and treatment villages, then spillover bias may be problematic.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. Note that the treatment dummy is 'differenced' away in fixed effects calculations. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

*** Significance at the 1 percent level.

** Significance at the 5 percent level.

* Significance at the 10 percent level.

5.6 Limitations

The following outline some potential limitations of this study. Firstly, it is difficult to generalize results to all ethnic groups in Sri Lanka and other areas of the country as the study only focuses on villages close to a main road in a recently cleared conflict area and only among people who read Sinhala.

Secondly, the focus on older people and males may skew results towards this demographic. Indeed, the summary statistics reveal that the percentage of male respondents was approximately 60 percent while the average age of respondents was approximately 39 years. Hence, it may be inappropriate to generalise these findings as those applicable to all potential voters.

5.7 Conclusion

The results of this study show how home delivery of state-run newspapers can influence political opinions of individuals across 'positive issues' (i.e. those that promote positive state actions) and across 'negative issues' (i.e. those that target opposition parties and other actors running against government policy). Conversely, intervention does not influence political opinions of individuals to conform to the views of the state (or incidentally, to conform to anti-government views) across 'defensive issues' (i.e. those that involve defending unpopular state actions). Hence the intervention may simply confirm existing political views maintained by individuals across 'defensive issues'.

This study reveals that state controlled print media can be a powerful tool for an incumbent government. Critically, in countries such as Sri Lanka, where the presidential candidate of the incumbent party won the election by 180,786 people (less than 1 percent of the popular vote in 2005), such control over state media institutions appears very important. The ramifications of this study are further exacerbated when considering the President's gains in the 2005 election were largely felt across remote villages much like the ones investigated in this study. Indeed, analysis reveals that under certain assumptions, if the state-run newspaper was abolished prior to the 2005 election, then the incumbent government's candidate would not have won the presidency. Even if these assumptions are violated,

results still suggest that home delivery of state-run newspapers influences the political opinions of individuals to conform to those of the state. Hence, the Sri Lankan government may be encouraged to provide state-sponsored home delivered newspapers to individuals.

If results from this study mirror results of similar studies in wider Sri Lanka and those of 64 countries ranked with media considered 'not free' (Freedomhouse 2008), tax payer funded state-run media may play a significant part in biasing voter opinions and influencing subsequent elections of government officials. Consequently, the policy implications are broad. For instance, incumbent governments in countries with state-run institutions may be encouraged to increase expenditure and outreach of state controlled media to generate extra votes. Alternatively, the results of this study may encourage aid agencies to support development of independent media organisations to counter bias from state-run media.

What of the private media? In countries where state-run media exists in conjunction with liberal censorship laws, the profit motives of private media may counteract the propaganda motives of state-run media. Conversely, in countries with draconian censorship laws, private media may be intimidated into silence or compliance with state directives. The exact nature of this relationship between private and state-run media and the ultimate impact they have on voter opinions warrants further research.

Appendix 5A

Table 5.A1: Calculation for the Average Estimated Readership among Rural Singhalese

Comments	Calculations: Silumina (Sunday Newspaper)	Calculations: Dinamina (Weekday Newspaper)		Reference
Total Circulation	265,000	75,000	a	ANCL (2008)
Estimated circulation into rural areas	132,500	37,500	b	In India, the distribution of newspapers between urban and rural was approximately 50-50 (NRS 2006). Note data for this distribut does not appear to exist in Sri Lanka. Hence circulation in rural a approximated at 0.5 x 'a'
Estimated readers per copy	6	6	c	There are 5 to 7 readers per copy for Indian newspapers (PCI 201 and there were 6 readers per copy for a Singhalese newspaper (N 2010). As there is no information on readers per copy for the Dinamina and Silumina papers, an estimate of 6 readers per copy used.
Estimated rural readership	795,000	225,000	d	= b x c
Ethnically Singhalese population	13,876,245	13,876,245	e	(Census 2001a)
Rural Singhalese population (%)	**76%**	**76%**	f	UNESCAP (2004)
Rural Singhalese population	10,545,946	10,545,946	g	= e x f
Estimated readership among rural Singhalese (%)	7.54%	2.13%	h	= d/g
Average estimated readership among rural Singhalese	**4.84%**		i	= average h

Appendix 5B

Cost of Living

The cost of living (COL), particularly the cost of rice, has increased substantially from 2007. To illustrate, in the first three quarters of 2006 and 2007, the amount spent on rice consumption and net exports in Sri Lanka was 35,191 million rupees and 38,725 million rupees respectively (QNA 2007). This increased to 870,250 million rupees for the first three quarters in 2008 (QNA 2007). Additionally, the cost of living increased during the survey period. The consumer price index, rose by 3.7 percent from May to June 2008, compared with a 1.8 percent change between April and May 2008 and 1.7 percent change between March and April (QNA 2007).

Examples of positive reporting in state-run newspapers relating to military victories against the Tamil Tigers

31 May 2008: "Forces capture strategic Tiger base"

6 June 2008: "Army destroys LTTE artillery gun"

12 June 2008: "Forces poised to regain Mullaitivu, capture Prabhakaran"

29 June 2008: "Forces capture Tigers' strategic 54 Base"

Examples of positive reporting in state-run newspapers relating to International Support for the government against the Tamil Tigers

30th April 2008: "UK arrests three Tiger suspects"

5th May 2008: "World Tamil Movement; 'A foreign branch of the LTTE in Canada'"

The Liberation Tigers of Tamil Eelam (LTTE) control the Montreal-based World Tamil Movement as one of their "foreign branches," in charge of raising funds for the war effort

and spreading propaganda, according to documents seized by the Royal Canadian Mounted Police (RCMP).

16th May 2008: "India extends LTTE ban, raises vigilance"

17th June, 2008: "Canada Bans World Tamil Movement listing it as a terrorist front for LTTE"

16th July 2008: "Melbourne Business College Director is a LTTE Terrorist"

Examples of defensive reporting in state-run newspapers relating to International displeasure at Sri Lanka relating to human rights abuses

29th May 2008: "LTTE, some political groups behind plan says Govt"

Minister Rambukwella emphasised that losing a seat at the UN Human Right Council was not a defeat and does not prove that Sri Lanka is violating human rights. The UNHRC was established in 2005 and Sri Lanka served a two year term. Since Sri Lanka gained over 50 percent votes we are eligible to contest for the UNHRC seat in the next term.

He said "when a country contests for the second time to win the same position there will be less support. Sri Lanka garnered 101 votes out of 192 votes, the number of votes obtained indicates a clear vote of confidence by UN Member States in Sri Lanka's ability and competence to serve as a council member," Minister Rambukwella said.

He pointed out that a huge contest had taken place for the UNHRC seat in the Asia region compared to the other regions. "Five groups contested for the UNHRC seat and there was a heated contest between six countries in the Asian region to select four countries for the council.

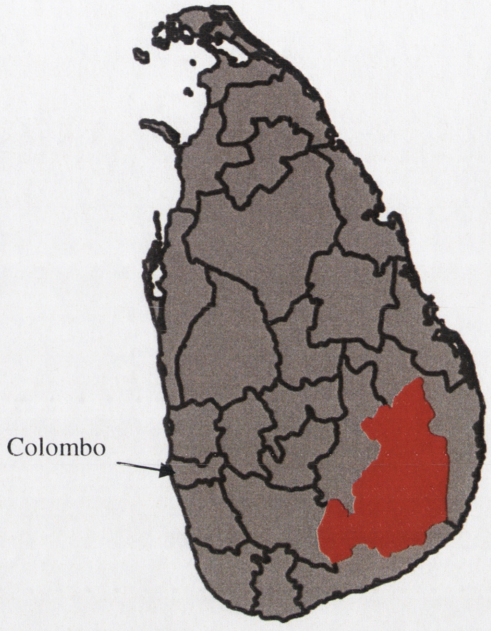
Spain was defeated by a vote in the European region contesting three countries for two seats in the council. Does this mean that Spain too has violated human rights ?," he asked.

30th April 2008: "Uma Oya project strengthens Lanka-Iran ties"

Appendix 5C

The highlighted section of figure 5.1 illustrates where the district of Monaragala is situated within Sri Lanka.

Figure 5.1: Map of Sri Lanka



The selection of treatment and control villages proceeded as follows. To determine whether the initial village was a treatment village (T) or a control village (C), the random number generator in Microsoft Excel was utilised. Specifically the command "randbetween(1,56)" was used. If the number was between 1 and 28, then a control village was selected while a number between 29 and 56 would imply a treatment village was selected. In this experiment, the random number generator first returned a number between 29 and 56, suggesting a treatment village should be the initial village. For the selection of the next village, the command "randbetween(1,55)" was used. Notice that the command has changed from "randbetween(1,56)" to "randbetween(1,55)" as the number of villages has reduced from 56 to 55.

Recall, the experimental design requires in 5 instances, a control village will follow a control village and in 5 other instances, a treatment village will follow a treatment village. Hence in 10 instances, a village will be of the same type as a previous village. The random number generator is now used for a fresh purpose. When using the command "randbetween(x,y)", if the random number generator produced a number between x and 10,

then the next village would be of *similar* type to the previous village (i.e. T followed by a T or C followed by a C). If the random number generator produced a number between 11 and y, then the next village would be of *different* type to the previous village (i.e. T followed by a C or C followed by a T). Initially x = 1 and y = 55. Every time a village is selected that is *different* to the previous village, the next random number generator command has the 'y' in "randbetween(x, y) subtracted by 1. Every time a village is selected that is the *same* as the previous village, the next random number generator command has the 'x' in "randbetween(x, y) added by 1.

Consider the case of this experiment. When using the command "randbetween(1,55)", the number returned was between 11 and 55, and as the first village was T, the next village chosen was 'C'. The next command used was "randbetween(1,**54**)". The number returned was between 11 and 54 and hence the next village selected was T. Using this technique, subsequent villages were 'C', 'T', 'C', 'T', 'C', 'T', 'C', 'T', 'C'. The pattern thus far is T, C, T, C, T, C, T, C, T, C.

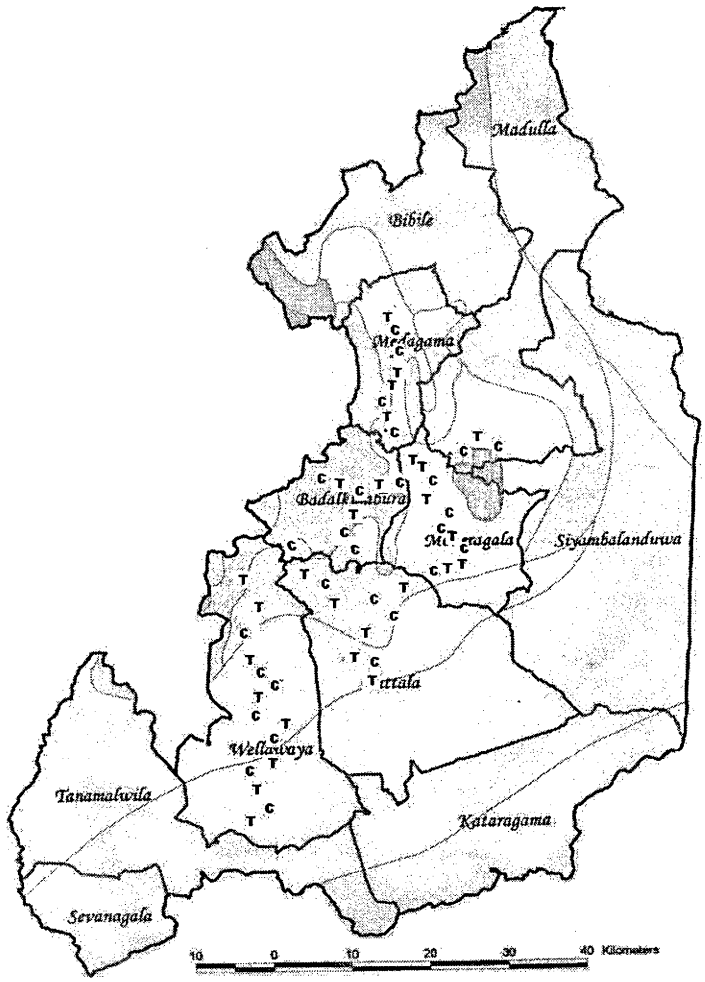
After the tenth village was selected, the command "randbetween(1,46)" was used and the random number generator returned a number between 1 and 10. Hence the next village selected was a control village. Thus the pattern is now T, C, T, C, T, C, T, C, T, C, C. When selecting the subsequent village, the command becomes "randbetween(**2**,45)". If a number between 2 and 10 is returned, the next village is the same as the previous village. As the number was between 11 and 46, the subsequent village selected was T. The pattern is now T, C, T, C, T, C, T, C, T, C, C, T.

If 10 villages of the same type have been located next to each other using the random number generator (i.e. 5 pairs of control villages or 5 pairs of treatment villages), then the next village following this village will always be different, regardless of what the random number generator suggests. For example, say 10 treatment villages have already been located next to each other. Then anytime a treatment village is selected, the next village would be a control village. In the experiment, this occurred after the 50th village was selected. If 10 control villages have already been located next to each other, then anytime a

control village is selected, the next village would be a treatment village. In the experiment, this occurred after the 52nd village was selected.

The treatment and control villages were selected as follows; T, C, T, C, T, C, T, C, T, **C, C**, T, C, **T, T**, C, T, C, T, **C, C**, **T, T**, C, T, **C, C**, T, C, T, C, T, C, T, C, **T, T**, C, T, **C, C**, T, C, **T, T**, C, T, C, **T, T**, **C, C**, T, C, T, C. Refer Figure 5.2:

Figure 5.2: Surveyed Villages in Monaragala



The district of Monaragala is separated into 11 administrative divisions spanning a total area of 7,133 sq kilometres[130]. Villages surveyed were located in 6 of these administrative divisions. Given the war in Sri Lanka at the time this survey was conducted, detailed maps of the area are prohibited from being published.

[130] Provinces of Sri Lanka 2008, <http://www.statoids.com/ulk.html>, viewed 07-09-09.

Appendix 5D

Table 5.D1: Impacts from Intervention across Entire Sample (2nd Round Data Only)

	Dependent Variables:													
	Answer to question A		Answer to question B		Answer to question C		Answer to question D		Answer to question E		Answer to question F		Answer to question G	
	Pro-Tamil Tigers bias of International Aid Agencies (5 point scale, higher on the scale implies a more pro-government stance)		Likely to not support an opposition party in the next election (5 point scale, higher on the scale implies a more pro-government stance)		Government's handling of the Cost of Living (5 point scale, higher on the scale implies a more pro-government stance)		Government's handling of the civil war (5 point scale, higher on the scale implies a more pro-government stance)		Level of International support given to the government against terrorism (5 point scale, higher on the scale implies a more pro-government stance)		Government's human rights record (5 point scale, higher on the scale implies a more pro-government stance)		Government's treatment of journalists (5 point scale, higher on the scale implies a more pro-government stance)	
Data Used^	OLS	Ordered Probit	OLS	Ordered Probit	OLS	Ordered Probit	OLS	Ordered Probit	OLS	Ordered Probit	OLS	Ordered Probit	OLS	Ordered Probit
Time Period 2*Treat Dummy (ITT)	0.260**	0.217**	0.241**	0.210**	-0.050	-0.061	0.202**	0.234**	0.322***	0.278***	0.006	0.003	0.019	0.008
	(0.085)	(0.074)	(0.080)	(0.073)	(0.062)	(0.076)	(0.063)	(0.076)	(0.083)	(0.073)	(0.087)	(0.073)	(0.073)	(0.073)
Mean dependent variable	3.483	3.483	3.050	3.050	1.902	1.902	3.987	3.987	3.232	3.232	3.334	3.334	3.095	3.095
Observations	824	824	824	824	824	824	824	824	824	824	824	824	824	824
R^2 (Overall)	0.011		0.011		0.001		0.012		0.018		0.000		0.000	

ITT refers to Intent to Treat.

Standard errors not corrected for robustness in parenthesis. Robust standard errors and standard errors clustered at village level produce coefficients with the same or higher level of significance. Time Period 2 equals 0 if data was collected in the first time period and equals 1 if data was collected in the second time period. The Treatment Dummy equals 0 if a village did not receive intervention and equals 1 if a village received intervention. The number of observations do not include any observations from the 16 people who did not answer survey questions in the second round survey.

*** Significance at the 1 percent level, ** Significance at the 5 percent level, *** Significance at the 10 percent level.

Appendix 5E

The following transition matrix illustrates the transition from a pro-government, uncertain or pro-opposition stance from time 1 to time 2 across control group members.

Table 5.E1 - Transition Matrix (Control Group members)

	Pro-government	Uncertain	Pro-Opposition
Pro-government	91%	6%	3%
Uncertain	11%	71%	18%
Pro-Opposition	1%	9%	90%

Observations = 411 Control Group Members

The following transition matrix illustrates the transition from a pro-government, uncertain or pro-opposition stance from time 1 to time 2 across treatment group members.

Table 5.E2 - Transition Matrix (Treatment Group members)

	Pro-government	Uncertain	Pro-Opposition
Pro-government	95%	5%	0%
Uncertain	13%	87%	0%
Pro-Opposition	14%	14%	72%

Observations = 413 Treatment Group Members

Results suggest one of the strongest influences of intervention was to limit an increase in the number of 'uncertain' people becoming 'pro-opposition' supporters. To illustrate, tables 5.E1 and 5.E2 reveal that the transition of people who were initially uncertain to pro-opposition is greater among control group members (18 percent) relative to treatment group members (0 percent).

Results also suggest a strong influence of intervention was to increase the number of 'pro-opposition' supporters becoming 'pro-government' supporters. To illustrate, tables 5.E2 and 5.E1 show that the transition of people who were initially pro-opposition to pro-government is greater among treatment group members (14 percent) relative to control group members (1 percent).

The transition of people who were initially pro-government is approximately the same between control group members and treatment group members.

Appendix 5F

Table 5.F1: Calculations for change in votes if the state-run newspaper was abolished

Comments	Calculations			Reference
Impact of *reading* a state-run newspaper on political preferences (percentage points)	10.1%	19.1%	a	Table 6d TOT estimates
Country wide circulation of state-run newspapers	510,000	510,000	b	http://www.sundayobserver.lk/2001/pix/AdvLoc.asp
Estimated average readers per newspaper	6	6	c	Note the estimated average number of readers per newspaper in the United States is 2.477 (sourced from http://www.naa.org/docs/Research/RPC2007.pdf)
Total number of people reading a newspaper	3,060,000	3,060,000	d	= b X c
Approximate population	20,000,000	20,000,000	e	Approximate population level of Sri Lanka
Percentage of population reading a newspaper	15.30%	15.30%	f	= d/e
Total number of voters in the 2005 presidential election	9,717,039	9,717,039	g	http://www.slelections.gov.lk/pdf/2005%20Presidantial-Summary.pdf.
Number of voters reading a newspaper	1,486,706.97	1,486,706.97	h	= f * g
Number of voters influence by state-run newspapers to vote for the incumbent party candidate	149,571.34	284,588.57	i	= a x h
Number of voters who would have voted for the opposition if they did not read the state-run newspaper	149,571.34	284,588.57	j	= i
Total net loss of voters for the incumbent party candidate at current circulation levels	299,142.69	569,177.14	k	= i + j

Chapter 6 – Conclusion

This dissertation has provided examples of three different evaluations using survey level data. Clearly, the third experimental evaluation is the most rigorous. Unlike the first quasi-experimental evaluation, there is no need to justify why non-random program placement and selection bias is unlikely to be problematic. Further, as opposed to the first and second evaluations, it does not suffer from omitted variable bias. Hence, where practical, evaluations should follow an experimental approach to achieve the most rigorous results.

The following outlines the major contributions of the three evaluations to literature and suggestions for future research.

6.1 Contribution

Each of the three evaluations has demonstrated that micro-savings, time preferences and state-run newspaper bias significantly impact on individual or household behaviour in developing countries. The main contributions from each of the three chapters of the dissertation are as follows:

Chapter 3 – Impact From Access to Formal Savings Facilities.

- While the majority of prior studies focus on measuring welfare due to increased wealth from using formal savings facilities, this study is the first to measure welfare impacts due to formal savings facilities being used as a payment tool and reallocation tool.
- This study is the first to demonstrate that access to formal savings facilities in a Pacific Island country improves welfare by reducing the difficulty associated with paying for 'lumpier' items. It is also the first to demonstrate that formal savings facilities used as commitment devices generate greater welfare gains relative to when formal savings facilities are used as reallocation devices.

Chapter 4 – Impact of Time Preferences on an Individual's Decision to Maintain an Open Savings Account.

- This study is the first to consider the impacts of future-biased time preferences and time consistent preferences on human behaviour.
- This study is also the first to demonstrate that an individual with present-biased time preferences or future-biased time preferences are more likely to maintain an open savings account than an individual with time consistent preferences.

Chapter 5 – Impact of State-Run Newspapers on Political Opinions

- While previous studies have focused on impacts of multiple newspapers with opposing views, this study focuses on impacts of a state-controlled newspaper which presents the views of the incumbent government.
- This study is the first experiment on this topic undertaken in a developing country.
- This study is also the first to demonstrate that home delivering a state-controlled newspaper significantly influences some political opinions of individuals in a developing country to conform to the views of the state.

6.2 Future Research

The results and conclusions of this dissertation have provided scope for future research. In relation to the first evaluation, greater investigation into the potential welfare impacts of accessing formal savings facilities in Pacific Island countries can be undertaken. These may focus on using actual dollar amounts to disaggregate the extent to which interventions impacts the welfare of people who have committed to saving more, relative to those who have saved less. Additional research may also be warranted to determine if individuals believe the welfare benefits of anonymity and safety, in relation to accessing formal savings facilities, are a sufficient trade-off to the convenience of keeping cash at home.

Future research may also involve undertaking a randomised evaluation to estimate the welfare impacts from access to formal savings facilities. For example, at time 1, a baseline survey of households in a sample of villages in the Solomon Islands could be undertaken. These villages would not have previous access to formal savings facilities nor should they

experience any spillover effects from other villages with access to formal savings facilities. The researcher could then convince ANZ Bank to randomly provide savings facilities to half the number of villages from the pool of villages that completed the baseline survey. Approximately a year later, at time 2, a second round survey could be undertaken. A fixed effects model or given the randomised nature of the evaluation, a cross-sectional model using only second round data, could be regressed to estimate the impact of intervention.

In relation to the second evaluation, future research may involve gathering dollar values to investigate whether people with present-biased time preferences commit to saving more relative to those with constant time preferences. Another interesting avenue of research is to specifically ask additional questions to determine if individuals with present-biased preferences, as suggested by hypothetical time preference questions, demonstrate sophistication. For instance, they may be asked how much money they would take if they were offered a loan at the prevailing market interest rate. Controlling for other variables, if the majority of people with present-biased time preferences take lower value loans relative to people with constant time preferences, then it can be argued, in relation to provision of credit, that most people are sophisticated enough to understand their level of self-control and act accordingly. Finally, further research into whether the majority of people are time-consistent or time-inconsistent may be undertaken. If results support those of this study, and other recent studies (Ashraf *et al.* 2006; Meier and Sprenger 2008a), then there is justification to focus greater resources into understanding the influences of time-consistency relative to time-inconsistency.

In relation to the third evaluation, additional research can be undertaken on the impacts of other media, such as television and radio, in influencing individual political opinions. Impacts of other variables, such as ethnicity, economic status, percentage of people in a village with children in the army and education, can also be regressed to determine the impact of these variables on individual political opinions. Further, it would be interesting to ascertain whether state-controlled media is more or less likely to impact people within more developed urban areas relative to people in the less developed rural areas investigated in this study. This would provide evidence of the relative susceptibility of people in different economic and educational demographics to state-controlled newspaper bias.

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